1974

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INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE AND PINK SALMON FISHERIES
IN THE FRASER RIVER SYSTEM

ANNUAL REPORT

1974

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COMMISSIONERS

DONALD R. JOHNSON
THOR C. TOLLEFSON
WILLIAM G. SALETIC

W. R. HOURSTON
RICHARD NELSON
RODERICK HAIG-BROWN

NEW WESTMINSTER
CANADA
1975

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

MEMBERS AND PERIOD OF SERVICE SINCE THE INCEPTION OF THE COMMISSION IN 1937

CANADA

William A. Found	1937-1939
A. L. Hager	1937-1948
Senator Thomas Reid	1937-1967
A. J. Whitmore	1939-1966
	1968-1969
Olof Hanson	1948-1952
H. R. MacMillan, C.B.E., D.Sc.	1952-1956
F. D. Mathers	1956-1960
W. R. Hourston	1960-
Richard Nelson	1966-
Roderick Haig-Brown	1970-

UNITED STATES

Edward W. Allen	1937-1951
	1957-1957
B. M. Brennan	1937-1942
Charles E. Jackson	1937-1946
Fred J. Foster	1943-1947
Milo Moore	1946-1949
	1957-1961
Albert M. Day	1947-1954
Alvin Anderson	1949-1950
Robert J. Schoettler	1951-1957
Elton B. Jones	1951-1957
Arnie J. Suomela	1954-1961
DeWitt Gilbert	1957-1974
George C. Starlund	1961-1966
Clarence F. Pautzke	1961-1969
Thor C. Tollefson	1966-
Charles H. Meacham	1969-1970
Donald R. Johnson	1971-
William G. Saletic	1974-

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RODERICK HAIG-BROWN

DIRECTOR - A. C. COOPER
ASSISTANT DIRECTOR - J. F. ROOS

NEW WESTMINSTER
CANADA
1975

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REPORT OF THE
INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION
FOR THE YEAR 1974

During the 37 years since the Commission was established, there have been significant increases in numbers and efficiency of fishing gear and in fishing areas. In addition, the proportion of the Fraser catch made in various fishing areas both inside and outside of Convention Waters has changed. The Commission has, since 1946, adjusted its management procedures within Convention Waters to take cognizance of these changes. Since the Convention does not specify how the allowable catch in Convention Waters should be apportioned amongst the various fisheries in each country, the Commission, guided by members of the Advisory Committee, has followed reasonable principles of allocation of catch to the various fisheries. Understandably, each fishery would like a larger share of the total allowable catch. However, the proportion of catch available to the traditional Convention Waters net fisheries has declined in recent years and could continue to decrease if recent trends in other fisheries continue. As shown in the following table, during the last six cycles of the 1974 cycle run there has been a very substantial growth since 1954 in Fraser sockeye catch by the coastal troll fishery, both in Convention Waters and outside Convention Waters. There has also been an increase in the net fishery catch outside of Convention Waters in the last four cycles. Similarly, there has been substantial growth in the Indian subsistence fishery catches from sockeye migrating up the Fraser to the spawning grounds. Thus the numbers of sockeye available to the net fishery in Convention Waters are being reduced by catches made prior to the runs entering the net fishing area, and further, the allowable catch in the Convention Waters net fishery has to be reduced to ensure adequate escapement past the Indian fishery to the spawning grounds.

FRASER RIVER SOCKEYE CATCHES AND ESCAPEMENTS

	1954	1958	1962	1966	1970	1974
Non-Convention						
Nets	121,240	4,228,342	137,662	675,820	977,822	1,294,261
	(0.99%)	(22.44%)	(3.92%)	(12.38%)	(15.85%)	(14.93%)
Troll	10,054	102,327	18,524	23,798	201,771	428,446
	(0.08%)	(0.54%)	(0.53%)	(0.44%)	(3.27%)	(4.94%)
Convention						
Nets	9,510,270	10,492,227	1,583,069	2,664,780	2,745,519	4,528,625
	(77.74%)	(55.67%)	(45.12%)	(48.81%)	(44.50%)	(52.25%)
Troll	13,742	6,102	11,597	22,106	145,788	425,330
	(0.11%)	(0.03%)	(0.33%)	(0.40%)	(2.36%)	(4.91%)
Indian	94,542	82,365	134,594	154,059	151,123	222,057
	(0.77%)	(0.44%)	(3.84%)	(2.82%)	(2.45%)	(2.56%)
Escapement	2,485,101	3,934,343	1,622,960	1,919,336	1,948,171	1,769,366
	(20.31%)	(20.88%)	(46.26%)	(35.15%)	(31.57%)	(20.41%)
TOTAL RUN	12,234,949	18,845,706	3,508,406	5,459,899	6,170,194	8,668,085

The escapement in 1974 was the same percentage of the total run as in 1954, but the number of spawners was the second smallest of the last six cycle years. The Commission can and has adjusted its management on account of the changes that have

taken place. Theoretically, it could continue to make adjustments if further changes occur. However, weekly fishing periods of one to three days for the Convention Waters net fishery are now common and extended closed periods are necessary occasionally. Consideration must be given to the maintenance of practical fishing periods. The Commission's Advisory Committee members, representing all segments of the fishing industry, are directly concerned with the economic well-being of the industry and the Commission is obligated to give consideration to their concerns. It is absolutely essential for perpetuation and extension of the resource that proper escapements of sockeye and pink salmon be obtained to the various spawning grounds. Equitable regulation of all aspects of the harvest in Convention Waters is desirable to ensure that all users of the resource participate in conservation measures. The Commission will be making a detailed examination of the situation in 1975.

Three years ago the Commission recommended a $14 million Development Program for Fraser River sockeye and pink salmon. This program could double the catches of pink salmon and triple the catches of sockeye produced in the Fraser system with a benefit-cost ratio of 9.5:1. Existing channels at Weaver Creek, Upper Pitt River and Seton Creek have proven the soundness of this enhancement concept. If the recommended program had been started as planned by the Commission, the first benefits to fishermen would have occurred in 1975 with the return of pink salmon to the Chilliwack River channel, followed in 1978 by returns of sockeye to Upper Pitt River and Upper Adams River channels. The increasing pressure for utilization of the resource and the continuing encroachment of human activities on the freshwater environment so essential to reproduction of salmon, emphasize the urgency of proceeding with the program. The Commission is very much concerned about the continuing delay in implementing the program, particularly since both Canada and the United States are implementing or planning extensive salmon enhancement programs for other Pacific Coast salmon stocks. Failure to proceed with the Commission's recommended program on the Fraser deprives all the resource users of benefits calculated at in excess of $14 million annually at 1971 prices or $26 million at 1974 prices.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held nineteen formal and fifteen telephone meetings during 1974 with the approved minutes of these meetings being submitted to the Governments of Canada and the United States.

The first meeting of 1974 was held February 1, with Mr. W. R. Hourston serving as Chairman and Mr. Donald R. Johnson as Vice-Chairman and Secretary. Mr. DeWitt Gilbert, who had served as a United States Commissioner since 1957, announced his resignation as a Commissioner. The Commission approved the appointment of Mr. Glenn Schuler as the United States Reef Net representative to the Advisory Committee. The Commission adopted Financial Administration Regulations for the Commission, to take effect April 1, 1974, the beginning of the first fiscal year in which the Commission will receive funds directly from the two national governments. The Commission met with the Advisory Committee regarding the tentative recommendations for regulatory control of the 1974 sockeye salmon fishery in Convention Waters, as submitted to the Committee by the Commission on December 7, 1973. After certain revisions the Commission approved the recommended regulations

for submission to the two national governments. The Commission's Advisory Committee was composed of the following members for 1974:

United States	*Canada*
N. Mladinich Purse Seine Fishermen	J. Brajcich Purse Seine Fishermen
D. Franett Salmon Processors	L. Monk Salmon Processors
R. Christensen Gill Net Fishermen	F. Nishii Gill Net Fishermen
G. Schuler Reef Net Fishermen	H. Stavenes Purse Seine Crew Members
G. Simmons Troll Fishermen	M. Ellis Troll Fishermen
E. Engman Sport Fishermen	H. English Sport Fishermen

The Commission met on May 2 and 3 at the Sweltzer Creek Research Laboratory and at Harrison Hot Springs Hotel. Reports were given by the staff on the following subjects: 1. Productivity of the various sockeye rearing lakes, 2. Prespawning mortality studies on the Horsefly River, 3. Development of an even year pink salmon run, 4. Isolation of toxic components of pulp mill effluent and upgrading of pulp mill treatment processes, 5. Temperature tolerance of adult sockeye, and 6. Toxicity of primary and secondary sewage plant effluent and toxicity of chlorinated effluent and dechlorinated effluent. Administrative and budgetary matters were also considered.

The third meeting of the Commission was held on June 14 and, at the request of the Washington State Fisheries Department, two changes were approved by the Commission in the 1974 commercial fishing regulations restricting trolling in Convention Waters. Proposals for development of an even year pink salmon run and sockeye egg plant in the Upper Adams River were approved. A report was given on the fry and smolt migration for the spring of 1974. The Commission also approved the appointment of Mr. Ian Williams as Chief of the Biology Division.

During the period June 20 to October 3 inclusive, the Commission held thirteen formal and fifteen telephone meetings for adjustment of fishing regulations to achieve the desired escapement and, as nearly as practicable, equitable division of the allowable catch of Fraser River sockeye salmon. On August 9 the Commission welcomed Mr. W. G. Saletic as the new United States Commissioner replacing Mr. DeWitt Gilbert. On September 6 the Commission met with the Advisory Committee to review the events of August 28 involving Canadian purse seines fishing outside the designated fishing areas of Area 18 of Canadian Convention Waters.

On October 18 the Commission met in Kamloops with its Advisory Committee, and then proceeded to the Adams River and Lower Shuswap River to view the spawning grounds.

The eighteenth formal meeting of the Commission was held on December 6. The Commission considered the proposed regulations and predictions for the 1975 sockeye and pink salmon run as well as administrative matters. The Commission also discussed a proposal from United States Commissioners to permit the United States to make a domestic allocation of its share of the catch in Convention Waters to Indian fishermen under the 1973 United States District Court decision. The Commission concluded that it was not a proper matter for consideration by the Commission.

The nineteenth and final formal meeting of the year was held on December 11 in Bellingham, Washington when the Commission met with its Advisory Committee, staff and approximately 500 representatives of industry, government and press. The catch and escapement statistics for the 1974 fishing season were presented by the staff. Reports were also presented on the following topics: 1. Production of sockeye salmon from Commission spawning channels, 2. Summary of pollution investigations, 3. Proposed development of an even year pink salmon run to the Fraser River, 4. Lake productivity studies. Prospects for the 1975 fishing season were reviewed and tentative proposals for regulating the 1975 fishery were released subject to further consideration by members of the industry and their representatives on the Commission's Advisory Committee.

1974 REGULATIONS

Recommendations for regulations governing the 1974 sockeye salmon fishery in Convention Waters were adopted at a meeting of the Commission held on February 1, 1974 and submitted to the two national governments for approval and to the State of Washington for implementation on February 21, 1974. The recommendations for Canadian Convention Waters were implemented by an Order-in-Council dated June 27, 1974 and for United States Convention Waters by an Order of the Director of the Washington State Department of Fisheries on May 20, 1974.

The recommendations of the Commission were as follows:

Canadian Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930 as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends that, in the interests of such fisheries, the following Fraser River Sockeye and Pink Salmon Fishery Regulations for the season of 1974 be adopted by Order-in-Council pursuant to Section 34 of the Fisheries Act, namely:

1. (1) No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 in that portion of Area 20 lying westerly of a line drawn true south from Sheringham Point Lighthouse to the International Boundary with nets from the 23rd day of June, 1974 to the 27th day of July, 1974, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with purse seines from the 28th day of July, 1974 to the 7th day of September, 1974, both dates inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets from the 28th day of July, 1974 to the 7th day of September, 1974, both dates inclusive, except from half past six o'clock in the afternoon of Sunday to half past six o'clock in the forenoon of Monday, from half past six o'clock in the afternoon of Monday to half past six o'clock in the forenoon of Tuesday and from half past six o'clock in the afternoon of Tuesday to half past six o'clock in the forenoon of Wednesday of each week.

(4) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with hook and line or trolling gear, except for the purpose of personal consumption and not for sale or barter, from the 28th day of July, 1974 to the 7th day of September, 1974, both dates inclusive, except at the times that net fishing may be permitted within that area.

2. (1) No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 in Areas 17 and 18, and in the Convention Waters portion of District No. 1 by means of nets:

(a) From the 23rd day of June, 1974 to the 20th day of July, 1974, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(b) From the 21st day of July, 1974 to the 3rd day of August, 1974, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(c) From the 4th day of August, 1974 to the 24th day of August, 1974, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(d) From the 25th day of August, 1974 to the 7th day of September, 1974, both dates inclusive, except from seven o'clock in the forenoon to seven o'clock in the afternoon of Monday of each week in the following described waters of the Fraser River upstream to the Canadian Pacific Railway Bridge at Mission City:

(i) In the Main Arm upstream from a straight line projected north and south magnetic through the Woodwards Training Wall West Light near Steveston; and

(ii) In Canoe Pass upstream from a line projected north and south magnetic through Brunswick Cannery; and

(iii) In the Middle and North Arms upstream from Oak Street Bridge; and

(e) From the 8th day of September, 1974 to the 14th day of September, 1974, both dates inclusive, except from:

(i) seven o'clock in the forenoon of Monday to seven o'clock in the forenoon of Tuesday in those waters described in subsection (d) of this section; and

(ii) seven o'clock in the forenoon of Monday to seven o'clock in the forenoon of Tuesday in those waters lying westerly of a line projected from Point Grey to the westerly end of the North Arm Jetty, thence to Sand Heads Light, thence to Canoe Pass Buoy, thence to a light on the westerly end of Tsawwassen Causeway and thence to where a straight line projected through Point Roberts Light intersects the International Boundary; and

(iii) seven o'clock in the forenoon to seven o'clock in the afternoon of Friday in those waters described in subsection (d) of this section; and

(f) From the 15th day of September, 1974 to the 28th day of September, 1974, both dates inclusive.

3. No person shall fish for sockeye or pink salmon in the Convention Waters portion of District No. 1 by means of nets from the 29th day of September, 1974 to the 12th day of October, 1974, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week.

4. No person shall fish for sockeye or pink salmon with hook and line or trolling gear, except for the purpose of personal consumption and not for sale or barter, in the Convention Waters of Canada lying easterly and inside of a straight line projected from Gower Point at the westerly entrance to Howe Sound to Thrasher Rock Light, thence in a straight line to Salamanca Point on the southerly end of Galiano Island, thence in a straight line to East Point on Saturna Island, thence in a straight line towards Point Roberts Light to the intersection with the International Boundary, thence following the International Boundary to its intersection with the mainland from the 11th day of August, 1974 to the 30th day of September, 1974, both dates inclusive, except at the times and locations that net fishing other than with chinook salmon nets may be permitted within that area.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

United States Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930 as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the United States Government that regulations to the following effect, in the interests of such fisheries, be adopted for the year 1974, and that an approved copy of said regulations be forwarded to the Director of Fisheries of the State of Washington for implementation by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. No person shall fish for sockeye or pink salmon by means of nets in the Convention Waters of the United States of America from the 23rd day of June, 1974 to the 13th day of July, 1974, both dates inclusive.

2. (1) No person shall fish for sockeye or pink salmon in the Convention Waters of the United States of America lying westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia with purse seines:

(a) From the 14th day of July, 1974 to the 20th day of July, 1974, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday; and

(b) From the 21st day of July, 1974 to the 10th day of August, 1974, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week; and

(c) From the 11th day of August, 1974 to the 7th day of September, 1974, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 14th day of July, 1974 to the 20th day of July, 1974, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday; and

(b) From the 21st day of July, 1974 to the 27th day of July, 1974, and from the 4th day of August, 1974 to the 10th day of August, 1974, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday, from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday of each week; and

(c) From the 28th day of July, 1974 to the 3rd day of August, 1974, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday, from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday and from seven o'clock in the afternoon of Wednesday to half past nine o'clock in the forenoon of Thursday; and

(d) From the 11th day of August, 1974 to the 17th day of August, 1974, and from the 25th day of August, 1974 to the 31st day of August, 1974, all dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday, from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday and from six o'clock in the afternoon of Wednesday to nine o'clock in the forenoon of Thursday of each week; and

(e) From the 18th day of August, 1974 to the 24th day of August, 1974, and from the 1st day of September, 1974 to the 7th day of September, 1974, all dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday, from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week.

3. (1) No person shall fish for sockeye or pink salmon in the Convention Waters of the United States of America lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia with purse seines:

(a) From the 14th day of July, 1974 to the 20th day of July, 1974, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday; and

(b) From the 21st day of July, 1974 to the 10th day of August, 1974, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week; and

(c) From the 11th day of August, 1974 to the 7th day of September, 1974, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with reef nets:

(a) From the 14th day of July, 1974 to the 20th day of July, 1974, both dates inclusive, except from half past ten o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, from five o'clock in the forenoon to half past nine o'clock in the afternoon of Tuesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Wednesday; and

(b) From the 21st day of July, 1974 to the 27th day of July, 1974, and from the 4th day of August, 1974 to the 10th day of August, 1974, all dates inclusive, except from half past ten o'clock in the forenoon to half past nine o'clock in the afternoon of Sunday, from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Wednesday of each week; and

(c) From the 28th day of July, 1974 to the 3rd day of August, 1974, both dates inclusive, except from half past ten o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, from five o'clock in the forenoon to half past nine o'clock in the afternoon of Tuesday and Wednesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Thursday; and

(d) From the 11th day of August, 1974 to the 17th day of August, 1974, and from the 25th day of August, 1974 to the 31st day of August, 1974, all dates inclusive, except from half past ten o'clock in the forenoon to nine o'clock in the afternoon of Monday, from five o'clock in the forenoon to nine o'clock in the afternoon of Tuesday and Wednesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Thursday of each week; and

(e) From the 18th day of August, 1974 to the 24th day of August, 1974, and from the 1st day of September, 1974 to the 7th day of September, 1974, all dates inclusive, except from half past ten o'clock in the forenoon to nine o'clock in the afternoon of Sunday, from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and Tuesday and from five o'clock in the forenoon to half past ten o'clock in the forenoon of Wednesday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 14th day of July, 1974 to the 20th day of July, 1974, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday; and

(b) From the 21st day of July, 1974 to the 27th day of July, 1974, and from the 4th day of August, 1974 to the 10th day of August, 1974, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday, from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday of each week; and

(c) From the 28th day of July, 1974 to the 3rd day of August, 1974, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday, from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday and from seven o'clock in the afternoon of Wednesday to half past nine o'clock in the forenoon of Thursday; and

(d) From the 11th day of August, 1974 to the 17th day of August, 1974, and from the 25th day of August, 1974 to the 31st day of August, 1974, all dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday, from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday and from six o'clock in the afternoon of Wednesday to nine o'clock in the forenoon of Thursday of each week; and

(e) From the 18th day of August, 1974 to the 24th day of August, 1974, and from the 1st day of September, 1974 to the 7th day of September, 1974, all dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday, from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week.

4. (1) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of section 3 lying westerly of a straight line drawn true south from the southeast tip of Point Roberts in the State of Washington (otherwise known as Lily Point) to the International Boundary with nets from the 8th day of September, 1974 to the 21st day of September, 1974, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of section 3 lying northerly and westerly of a straight line drawn from Iwersen's Dock on Point Roberts in the State of Washington to Georgina Point Light at the entrance to Active Pass in the Province of British Columbia with nets from the 22nd day of September, 1974 to the 28th day of September, 1974, both dates inclusive.

5. (1) The foregoing recommended regulations shall not apply to the following United States Convention Waters:

(a) State Fishing Area No. 7 including all Convention Waters known as Bellingham Bay lying inside of a line extending from Point Frances through the Post Point Bell Buoy to the mainland, and

(b) That portion of State Fishing Area No. 3 lying easterly and inside of a line projected from Carter Point on Lummi Island to the most northerly tip of Vendovi Island, thence to Clark Point on Guemes Island including the waters of Samish Bay, and

(c) State Fishing Area No. 4, and

(d) Preserves previously established by the Director of Fisheries of the State of Washington for the protection of other species of food fish.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

Emergency Orders

In order to provide for adequate racial escapement of Fraser River sockeye salmon and for an equitable share of the season's catch by the fishermen of the United States and Canada, the approved regulations as detailed above were later adjusted by the Commission as follows:

June 14, 1974 – At the request of the Director of the Washington State Fisheries Department to meet his obligations under a Federal court decision, the Commission approved the following changes: 1. That those portions of United States Convention Waters westerly of the Bonilla Point-Tatoosh Island line and contained within State Coastal Fishing Areas 1 and 2 be closed to commercial salmon fishing from June 23 to September 7 inclusive, 2. That those United States Convention Waters in State Puget Sound Fishing Area 2 (Juan de Fuca Strait) be closed to commercial trolling or hook and line fishing except from Monday through Friday of each week at those times when the net fishery is permitted to operate. The Commission also delayed the scheduled July 1 opening in Canadian Convention Waters easterly of the William Head-Angeles Point Line by 24 hours.

June 20, 1974 – On request of the Fraser River Harbor Commission, the Commission closed Areas 17, 18 and District No. 1 of Canadian Convention Waters to commercial fishing until further notice, due to abnormal high runoff and danger to dykes from boat traffic.

June 25, 1974 – Following a decline in the level of the Fraser River, the Commission opened Areas 17, 18 and District No. 1 of Canadian Convention Waters for 24 hours fishing commencing Thursday, June 27, at 8:00 a.m.

July 5, 1974 – The Commission delayed the opening in Areas 17, 18 and District No. 1 of Canadian Convention Waters on July 8 by 4 hours, with fishing commencing at 12:00 noon July 8 for 24 hours, to facilitate voting by fishermen in the Federal election.

July 8, 1974 – To provide further harvest of the Early Stuart run, the Commission approved an additional 24 hours fishing in Areas 17, 18 and District No. 1 of Canadian Convention Waters from noon July 9 to noon July 10.

July 9, 1974 – In the interest of additional harvest of the Early Stuart run, the Commission approved an extension in fishing time by 20 hours in Areas 17, 18 and District No. 1 of Canadian Convention Waters to 8:00 a.m. July 11.

July 22, 1974 – In the interest of securing escapement of summer races, the Commission reduced fishing time in United States Convention Waters by 24 hours, making two days fishing for the current week.

August 2, 1974 – In order to secure adequate escapement of the summer races, the Commission delayed the scheduled openings in all United States Convention Waters and Area 20 of Canadian Convention Waters by 48 hours and reduced fishing time to two days from the scheduled three days in both areas.

August 9, 1974 – In the interest of division of catch and to provide adequate escapement of Chilko River sockeye delaying in the Strait of Georgia, the Commission announced that the Area 20 and the Areas 17, 18 and District No. 1 fisheries of Canadian Convention Waters would not open as scheduled for the week commencing August 11 and would remain closed until further announcement.

August 13, 1974 – In the interest of division of catch and additional harvest of Chilko River sockeye, the Commission approved the following regulation changes: 1. That fishing in all United States Convention Waters be extended by 24 hours making a total of four days for the current week, 2. That Areas 17, 18 and District No. 1 of Canadian Convention Waters open for 24 hours commencing 8:00 a.m. Thursday, August 15.

August 16, 1974 – The Commission approved the following regulatory changes to facilitate management of summer sockeye races and Adams River sockeye: 1. That Area 20 of Canadian Convention Waters open Sunday, August 18 for two days, 2. That the scheduled opening in Areas 17, 18 and District No. 1 of Canadian Convention Waters be delayed 24 hours to 8:00 a.m. August 20, with 24 hours fishing, 3. That the scheduled opening in all United States Convention Waters be delayed 24 hours to August 20, with two days fishing.

August 19, 1974 – Due to the smaller than expected catches in Area 20 of Canadian Convention Waters, the Commission approved 24 hours additional fishing making a total of three days for the current week in that area.

August 21, 1974 – In the interest of division of catch, the Commission approved a 24 hour extension of fishing in all United States Convention Waters, giving a total of three days for the current week.

August 22, 1974 – In order to protect Adams River sockeye delaying in the Strait of Georgia, the Commission approved the following change in regulations: Fishing for sockeye by angling or trolling except for the purpose of personal consumption and not for sale or barter shall be prohibited in those Convention Waters lying easterly of a line from Reception Point to Orlebar Point on Gabriola Island, thence along the easterly shoreline of Gabriola Island to Joseph Point, thence in a straight line to Cordero Point on Valdez Island and along the easterly shoreline of Valdez Island to Vernaci Point, thence in a straight line to Race Point on Galiano Island and along the easterly shoreline of Galiano Island to Burrill Point, thence in a straight line to Georgina Point on Mayne Island, thence along the easterly shoreline of Mayne Island to Campbell Point, thence in a straight line to Winter Point on Saturna Island, thence along the easterly shore of Saturna Island to East Point, thence due east in a straight line to the International Boundary, except at the times and locations that net fishing for sockeye may be permitted within that area. The new boundary went into effect at noon, August 23, for the period to September 30, 1974.

August 23, 1974 – The Commission approved the following regulatory changes for the week commencing August 25: 1. That Area 20 of Canadian Convention Waters open as scheduled but for two days only, 2. That Areas 17, 18 and that portion of District No. 1 of Canadian Convention Waters westerly of the "Blue Line" open for 12 hours fishing from 7:00 p.m. Sunday, August 25 to 7:00 a.m. Monday, August 26, 3. That District No. 1 of Canadian Convention Waters lying easterly of the Brunswick Cannery-Oak Street Bridge line open 7:00 a.m. Monday, August 26, for 24 hours fishing instead of the scheduled 12 hours, 4. That United States Convention Waters open as scheduled, but for two days only, with the waters lying northerly and westerly of the Iwersen's Dock-Georgina Light line closed to all net fishing.

August 26, 1974 – In the interest of division of catch, the Commission approved an additional 24 hours fishing in Area 20 of Canadian Convention Waters making a total of three days for the current week.

August 27, 1974 – In the interest of division of catch, the Commission approved the opening of Canadian Convention Waters in District No. 1 westerly of the "Blue Line" and Areas 17 and 18 for 24 hours fishing commencing 8:00 a.m. Wednesday, August 28.

August 28, 1974 – Due to fishing by Canadian purse seiners in the closed waters of District No. 1 of Canadian Convention Waters and the Point Roberts area of United States Convention Waters, and because the continuation of such fishing could endanger the Adams River sockeye run delaying in the area, the Commission approved limiting fishing time for purse seines in Area 18 to twelve hours from 8:00 a.m. to 8:00 p.m. Wednesday, August 28 instead of the scheduled 24 hours.

August 30, 1974 – In the interest of division of catch and harvest of Adams River sockeye, the Commission approved the following regulatory changes for the week commencing September 1: 1. That the opening of Area 20 of Canadian Convention Waters be advanced one day, with fishing commencing Sunday, September 1, for two days, 2. That the opening in United States Convention Waters be delayed 24 hours for one day of fishing, with the waters westerly of the Lily Point line closed to all net fishing, 3. That the opening in District No. 1 of Canadian Convention Waters easterly of the Brunswick Cannery-Oak Street Bridge line be delayed 24 hours with fishing commencing at 7:00 a.m. Tuesday, September 3 for 24 hours, 4. That District No. 1 of Ganadian Convention Waters westerly of the "Blue Line" and Areas 17 and 18 except the waters easterly of the troll closure line (as stated on the Emergency Orders of August 22, 1974) open to fishing 7:00 a.m. Tuesday, September 3 for 24 hours.

September 6, 1974 – The Commission adopted the following regulation changes: 1. That in those Canadian Convention Waters of District No. 1 westerly of the "Blue Line" and Areas 17 and 18 except that portion easterly of the troll closure line (as described in Emergency Order of August 22, 1974) be opened to fishing from 7:00 a.m. Monday, September 9 for 24 hours, 2. That District No. 1 of Canadian Convention Waters easterly of the "Blue Line" remain closed until further notice.

September 10, 1974 – In the interest of division of catch and in order to harvest Adams River and Weaver Creek sockeye, the Commission approved the opening of those Canadian Convention Waters of District No. 1 westerly of the "Blue Line" and Areas 17 and 18 except that portion easterly of the troll closure line (as described in Emergency Order of August 22, 1974) for 24 hours fishing commencing 7:00 a.m. Thursday, September 12.

September 20, 1974 – In view of reduced sockeye abundance, the Commission decided to reestablish the originally scheduled troll boundary in Areas 17 and 18 of Canadian Convention Waters effective September 23 at 7:00 a.m.

September 26, 1974 – The Commission approved the opening of District No. 1 of Canadian Convention Waters commencing 8:00 a.m. September 30.

October 3, 1974 – Due to the declining abundance of sockeye, the Commission relinquished regulatory control of the remaining Convention Waters still in the Commission's control effective Sunday, October 6, one week earlier than scheduled, thus completing the Commission's regulatory obligations for Convention Waters for the 1974 season.

SOCKEYE SALMON REPORT

The Fishery

The total 1974 Fraser River sockeye run was estimated at 8,668,000, compared with the pre-season forecast of 8,000,000. It was the largest run since 1958. The number of Fraser sockeye entering Convention Waters was 6,945,000 of which 4,954,000 (71.3%) were caught commercially, 222,057 (3.2%) were taken by the Indian fishery, and 1,769,366 (25.5%) were recorded on the spawning grounds (see Tables I to VI in Appendix). An estimated total of 7,739 non-Fraser sockeye, mainly from the run to Lake Washington in Washington State, were also caught in Convention Waters. The estimated catches of Fraser River sockeye in non-Convention Waters in Johnstone Strait and northern Strait of Georgia, and coastal waters north of Convention Waters, were 1,207,000 and 516,000 respectively. The non-Convention Waters catch of Fraser River sockeye migrating through Johnstone Strait was 18.1% of the total commercial catch of Fraser sockeye in all areas, and 13.9% of the total run. The latter figure may be compared with a catch of 16.5% of the total run in 1970, the preceding cycle year.

The total 1974 Convention Waters catch of 4,961,694 sockeye was 2,069,706 larger than in the brood year 1970 and the total Fraser River sockeye run was 2,498,000 larger than the brood year. In the Convention area, Canadian fishermen caught 2,500,019 sockeye (50.39%) and United States fishermen caught 2,461,675 (49.61%) (Appendix Tables I and II).

The Adams River sockeye population was about 5,100,000 fish, the largest run since 1958. This population constituted about 59% of the total Fraser run. The rate of return of Adams sockeye in 1974 per female brood year spawner was the lowest of all major races returning. Two other races utilizing Shuswap Lake for rearing, the Lower Shuswap River and Seymour River populations, had an average return of about 37 adults per brood year female compared with 6.6 for the Adams run (Figure 1). Because of the much larger size of the Adams River escapement, a high rate of return such as occurred for the smaller Lower Shuswap River and Seymour River populations could not be expected. However, with such high rates of return for the two other stocks, the 1974 Adams run should have been at least double the actual return. Fry production from the Adams in the spring of 1971 was good but the total smolt population was not large. Survival of smolts was good, at least 10 to 12%, compared with 16.4% for Chilko sockeye. Extensive investigations are planned for determining fry production and assessing survival to smolts of the 1974 Adams River spawning.

The Chilko River, Birkenhead River, Lower Shuswap River and Weaver Creek populations were also major contributors to the 1974 catch. The Birkenhead run of 653,000 was the largest ever recorded and the Weaver Creek return of 303,000 was a record for the cycle year. The Lower Shuswap run of 552,000 was also the largest ever recorded and was a substantial increase over the brood year return of 72,000.

The 1974 net fishery in Convention Waters attracted a significantly higher amount of fishing effort compared with the brood year fishery. In Canadian Convention Waters the maximum daily units of gear is listed below during the peak of the sockeye season for 1970, 1973 and 1974. There were 148 less gill nets and purse seines combined fishing in 1974 than in 1970, and 105 less than in 1973.

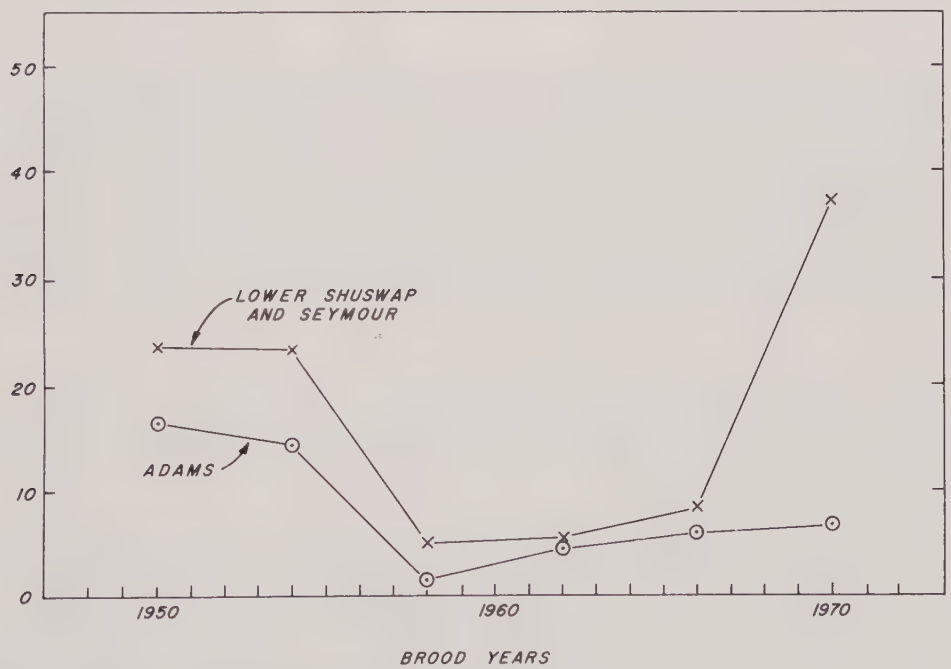

Figure 1. Return of adults per female spawner for Adams River run, and Lower Shuswap and Seymour River runs combined.

CANADIAN CONVENTION WATERS FISHING UNITS

	Purse Seine	*Gill Net*	*Total*
1970	87	1,263	1,350
1973	129	1,178	1,307
1974	202	1,000	1,202

However, the number of purse seines fishing in Canadian Convention Waters in 1974 reached a maximum of 202 in the Area 17, 18 and 20 fisheries compared with 87 in the brood year. In Area 20 there were 142 purse seine vessels, an increase of 55 from 1970, and this was reflected in the increased catch by that gear. The number of purse seines fishing Area 20 in 1974 was also higher than in 1973 and was the largest fleet ever to fish the area. In 1974 purse seines harvested 73.3% of the total season's net catch made in Area 20 compared with 53.2% in 1970. The total season's purse seine catch of 1,044,742 sockeye was the largest on the cycle since 1958. The percentage of Canadian Convention Waters catch by purse seines (41.79%) was the highest on the cycle since 1958 (Table I). The catch by this gear was 603,622 fish more than in 1970.

Gill net fishing effort decreased by 263 vessels in 1974 compared with 1970. Although the total catch by gill nets in 1974 was the largest on the cycle since 1958, the total of 1,029,678 was only 74,500 fish greater than that taken in 1970 and the percentage catch of 41.19% was the lowest recorded in any year. The maximum daily numbers of gill nets delivering sockeye in Area 20 decreased by 243 boats in 1974 compared with 1970, however, the combined gill net-purse seine fleet in 1974 was more effective in 1974 and removed a higher proportion of the Adams run in spite of the same number of days fishing in the two years on that race.

The 1974 troll catch of sockeye in Convention Waters was the largest ever recorded, both in number and percentage. The total catch of 425,599 troll caught sockeye in Canadian Convention Waters was 280,126 larger than in the previous brood year and the percentage catch of 17.02% surpassed the previous high of 9.44% set in the brood year. Late run races of sockeye, of which the Adams River race forms by far the largest proportion, are particularly vulnerable to troll gear when specific effort is made to catch them. The total landings of sockeye by this gear in Canadian Convention Waters on the 1974 cycle has increased 39.6 times from only 10,760 in 1962 to 425,599 in 1974. By comparison, the combined purse seine-gill net catch in 1974 was only 2.5 times greater than in 1962.

As shown in the following table, the total catch in Areas 17, 18 and District No. 1 of Canadian Convention Waters was only 37.36% of the Convention Waters catch compared to 64.06% in 1962, whereas the outside troll fishery landed 13.88% compared to 0.66% in 1962.

CANADIAN CONVENTION WATERS DISTRIBUTION OF CATCH, PERCENT

Year	*Outside Troll*	*Area 20*	*Area 17, 18 District 1*
1974	13.88	48.76	37.36
1962	0.66	35.28	64.06

The catch in Canadian Convention Waters west of William Head was 1,565,915 sockeye whereas the catch east of William Head was 934,104.

The share of Canadian Convention Waters catch taken by gill nets in District 1 has declined in each cycle since 1962, as shown in the following table, and the share in 1974 was the lowest percent of total catch in any year under Commission regulations.

CANADIAN CONVENTION WATERS
DISTRICT 1 GILL NET SOCKEYE CATCH, PERCENT

YEAR	1962	1966	1970	1974
PERCENT	63.28	46.46	36.66	28.10

In United States Convention Waters, there was an increase of 742 (102%) units of gear compared to the brood year, as shown below:

UNITED STATES CONVENTION WATERS FISHING UNITS

	Purse Seines	*Gill Nets*	*Reef Nets*	*Total*
1970	191	492	41	724
1973	156	739	50	895
1974	272	1,140	54	1,466

The maximum number of units of gear delivering sockeye on any one day in 1974 was double that of 1970 and was also substantially higher than in 1973. There was a maximum of 81 more purse seines and 648 more gill nets delivering sockeye on one day during the season in 1974, compared with 1970. Reef net gear increased by 13 over the brood year.

The catch by purse seines in United States Convention Waters of 1,515,444 was the largest catch on the cycle since 1958. The percentage harvest by purse seines was higher than in the last two cycle years. The total catch of 873,595 by gill nets was the largest ever recorded for the cycle: The reef net catch of 72,408 was the largest since 1958, but increased only slightly compared with the three previous cycle years, reflecting increased competition by mobile gear. Purse seine landings were 3.0 times larger than in 1962, with an increase of 1,010,416 fish, gill net landings were 4.5 times larger than in 1962, an increase of 681,517 fish, but reef net landings were only 1.2 times larger than in 1962, with an increase of only 11,714 fish. The reef net catch formed the lowest percentage (2.94%) on the cycle since 1958.

The increased fishing effort in Convention Waters in 1974 created a serious management problem for the Commission during August when the Adams River race was present in the Area 20 and United States fisheries. In 1970 there were 21 days of combined fishing in these two fisheries during passage of the main portion of the Adams run with a total of 11,577 purse seine, reef net and gill net deliveries during the period. In 1974 with 20 days of fishing, the total deliveries of sockeye rose to 17,464, an increase of 50.9%. No suitable method is available to assess accurately the Adams River sockeye escapement through the United States fishing area and into the Strait of Georgia, and thus, changes in fishing effort and gear efficiency can result in serious management problems. Based on seven other Adams River runs and considering days fishing and amount of fishing effort, it was expected that approximately 50% of the total Adams River run entering Juan de Fuca Strait would have been caught in the

Area 20 and United States fisheries. Instead, 60% were caught resulting in about 300,000 fewer Adams River sockeye available for further catch and escapement.

A most serious violation of fishing regulations occurred on August 28 when many Canadian purse seiners moved from Area No. 18, which was open to fishing, into the closed waters of District No. 1 and United States waters west of Point Roberts. A total of 148,257 sockeye were landed by 156 seine boats, far in excess of the numbers that would have been expected by a fishery in Area No. 18. An emergency closure limited purse seine fishing to 12 hours instead of the scheduled 24 hours. This action was required to prevent a much larger catch by the fleet, which would have further reduced the sockeye available to the Fraser area gill net fishermen and for escapement.

Total catches of sockeye by the coastal troll fishery off Washington State and Vancouver Island are shown below for the years 1964-1974. The total landings inside Convention Waters in 1974 were the largest of any year. Exploitation of sockeye stocks in 1974 by the entire coastal troll fishery was the highest of any year to date.

COASTAL TROLL CATCH OF SOCKEYE SALMON
WASHINGTON STATE TO CANADIAN AREA 27

	Convention Waters		*Non-Convention*	
Year	*Number*	*% of Total*	*Waters*	*Total*
1962	6,212	29.7	14,735	20,947
1963	4,131	48.7	4,348	8,479
1964	3,661	41.6	5,131	8,792
1965	8,814	54.8	7,267	10,081
1966	21,289	61.9	13,116	34,405
1967	133,088	61.4	83,616	216,704
1968	37,028	38.9	58,226	95,254
1969	59,292	38.8	93,498	152,790
1970	126,957	43.9	162,066	289,023
1971	183,194	31.2	404,037	587,231
1972	10,819	38.9	17,006	27,825
1973	50,913	50.5	49,938	100,851
1974	343,710	45.8	407,479	751,189

The percentage of the total Fraser River sockeye run taken in all non-Convention Waters fisheries was estimated at 19.9% in 1974. This was similar to the 1970 brood year catch of 19.1%.

The average weight of 4-year-old sockeye during the period July 22-September 1 was 6.50 pounds, slightly below the 1918-1970 cyclic average for the same time period of 6.61 pounds.

Escapement

The net escapement of 1,769,366 represented 25.5% of the 1974 Fraser run to Convention Waters and 20.4% of the calculated total Fraser River run. The total escapement was the lowest on the cycle since 1962, with several important races having below optimum escapements. Some smaller races did, however, show marked improvement in escapement compared to 1970.

The escapement of 51,536 sockeye to Early Stuart streams was the largest on the cycle since 1950. This race has increased from 10,859 spawners in 1966 and 34,566 in 1970.

The Bowron River escapement of 1,850 increased slightly compared with the brood year; however, a larger escapement would have been desirable.

The decrease in escapement to the Nechako District is cause for concern. No sockeye were observed in the middle and lower areas of the Nadina River where the Early Nadina run spawns. This is the first occasion on which sockeye were not observed on the Early Nadina spawning grounds. The Late Nadina escapement of 3,825 was 846 less than in the brood year and of the total, only 895 entered the spawning channel at the outlet of Nadina Lake. The Stellako River run was not as large as expected and the escapement of 41,473 was considerably below that desired, and was the lowest escapement on the cycle since 1938.

The escapement to Horsefly River of 4,459 sockeye was the largest recorded on the subdominant cycle. Approximately one-third of the escapement were 5-year-olds from the large 1969 brood year return.

The Chilko River escapement of about 110,000 adults was less than satisfactory and was the lowest on the cycle since 1962. In 1971 several thousand spawning sockeye were observed at the south end of Chilko Lake. These sockeye were smaller than Chilko River sockeye, exhibited lower fresh-water growth and returned earlier than Chilko River spawners. It appeared that this group of spawners was racially distinct from Chilko River spawners. In 1974 an estimated 14,000 3-year-old jacks returned to the south end of Chilko Lake indicating a substantial return in 1975.

Escapement into Raft River was far below a satisfactory level and the total of only 2,396 spawners was the lowest on the cycle since 1942. Fennell Creek, also on the North Thompson River system, has shown significant growth in recent years and the return of 103 jacks in 1974 indicates a good return of adults in 1975.

The escapement of 1,011,725 sockeye to the Adams-Little River area was considerably below the estimated optimum escapement of around 1,500,000 spawners recorded in the brood year. The total escapement was the lowest on the cycle since 1938 and is considered as a minimum number required on this cycle. However, since Adams River runs of about 9,000,000 sockeye have been produced from escapements of 750,000 and 1,226,000 in earlier years, the potential has been provided for at least a moderate return in 1978 if survival conditions are favorable.

The escapement to Lower Shuswap River was the largest escapement on record and probably the largest since 1909. The total of 86,396 spawners was an increase of 57,322 over the brood year. The river has 11 miles of excellent spawning gravel and can accommodate far greater numbers of spawners. The fry produced by these spawners enter Shuswap Lake at the midpoint of the Salmon Arm area of the lake, whereas Adams River fry enter the main arm. The Seymour River escapement also showed a pronounced increase over the brood year escapement, the total escapement of 45,189 fish being the largest on the cycle since 1962.

Escapements to both Gates Creek and Portage Creek in the Seton-Anderson system improved in 1974 compared to 1970, with the Portage Creek stock showing a great improvement after the drastic decline in 1970. All but 76 fish of the Gates Creek escapement were placed in the spawning channel.

Excellent production was observed from some of the populations spawning in the lower Fraser area. The Birkenhead River run continues to flourish and the escapement of 173,463 is the largest recorded, surpassing the previous high recorded in 1973 by 34,168 spawners. The 1974 escapement was 100,703 larger than in the brood year. The escapement to Weaver Creek was also the largest of any year on record and the total of 66,807 fish was an increase of 55,711 compared with 1970. The return again dramatized the beneficial effects of the spawning channel. The channel was filled to capacity with 24,664 sockeye.

The return of 20,792 sockeye to Upper Pitt River was more than three times the brood year escapement. The return to Cultus Lake was below the brood year whereas the Harrison run increased by about 4,000 spawners compared with 1970.

Success of spawning was excellent in all areas except at Weaver Creek where delay of sockeye entering Weaver Creek because of lack of rainfall and low water conditions caused some retention of eggs.

The Salute to the Sockeye programs were held again at Adams River with an estimated 125,000 visitors. The Weaver Creek channel also attracted 36,000 visitors.

The Indian food fishery catch of 222,057 sockeye in the Fraser River and tributary streams was the largest on record. In 1966 and 1970 this fishery removed 7.4% and 7.2% of the available sockeye whereas in 1974, 11.2% were removed. The increase in catch of 70,934 fish over the brood year was taken primarily from the summer races. There appears to have been a recent increase in the exploitation rate of summer races by the Indian fishery. Approximately 11.9% of the summer run sockeye in 1966 were removed, while the 1970 catch was 23.6% and the 1974 catch was 25.2% of these stocks. The catch of late run sockeye has varied only slightly, being 6.0%, 2.5% and 4.4% for 1966, 1970 and 1974 respectively. The increased exploitation of summer run stocks by Indian fisheries requires that increased gross escapement be provided to meet net escapement goals. The Indian food fishery took 2.6% of the total 1974 Fraser sockeye run while in the two previous brood years 2.8% (1966) and 2.4% (1970) of the run were taken in this fishery. In cycle years 1954 and 1958, the Indian food fishery took only 0.8% and 0.4% of the total run in the respective years.

Echo sounding techniques were again applied to the estimation of the sockeye escapement in 1974. The summer race gross escapement estimate was 14% low; in 1973 the estimate of summer race escapement was 16% high. The Adams River and other late race escapement estimates were 20% higher (300,000 fish) than were accounted for on the spawning grounds. A similar result was obtained from the usual test fishing operations and from other indices of abundance in Georgia Strait and at Hell's Gate. The reasons for the difference have not been determined, and further investigations are planned.

SPAWNING CHANNEL OPERATIONS

Fry production data for the 1973 spawning of sockeye and pink salmon at channels operated by the Commission are given in the following table.

FRY PRODUCTION AT SPAWNING AND INCUBATION CHANNELS FROM THE 1973 BROOD YEAR SPAWNING

Site	*Species*	*Eggs Deposited*	*Fry Produced*	*Percent Survival*
Weaver Creek	Sockeye	45,246,000	35,055,000	77.5
Gates Creek	Sockeye	992,000	899,000	90.6
Upper Pitt	Sockeye	2,366,000	1,793,000	75.8
Nadina River	Sockeye	13,360,000	9,906,000	74.1
Upper Seton	Pink	7,325,000	5,477,000	74.8
Lower Seton	Pink	25,808,000	16,227,000	62.9

At Weaver Creek the survival rate of eggs increased almost 20% from the previous year and was about equal to the nine-year average of 77.7%. This change is attributed to the cleaning of the gravel before the spawning in 1973 and also to the confinement of chum salmon to a special section of the channel, so that competition between sockeye and chum salmon spawners was eliminated. There were 0.6 sockeye spawners per sq yd of channel in 1973, and the survival rate was the same as for the 1967 spawning with only 0.09 females per sq yd, so there is no indication that survival has been affected by density of sockeye spawners up to 0.6 per sq yd. The 35 million fry produced by the channel was an increase of 2.4 million over the brood year and was the largest number ever produced by the channel. It now appears that even higher total production could be obtained with a further incremental increase in the number of spawners. In the fall of 1974, the channel accommodated 24,664 sockeye spawners, the largest number in the ten years of operation, and the density of female spawners increased to 0.71 per sq yd, so a further check on the effect of density of spawners will be obtained in the spring of 1975.

Survival rate from eggs to fry continued high at Gates Creek and Upper Pitt. Both of these installations operated at part capacity for the 1973 brood. The survival of 74% for the first year of operation of the Nadina channel is close to the average for the Weaver Creek channel. The Nadina channel was constructed on a continuous even gradient without drop structures, to avoid ice problems in the severe winter conditions, and it operated through the first season without problem.

The total escapement of the Late Nadina run in 1974 was only 3,825 sockeye, and 895 were diverted into the channel. Efforts to increase the proportion of sockeye entering the channel were unsuccessful, and in this respect the results are quite similar to the initial experience at the Weaver Creek channel.

At Seton Creek channels, with a density of spawners of nearly 0.7 females per sq yd in both 1971 and 1973, the numbers of fry produced from both broods have been the largest yet recorded. The fry production at the lower channel from the 1973 spawning increased nearly 3.5 million over the brood year due to additional spawners. It is evident from the results to date that there could be a further incremental increase in number of spawners without jeopardizing maximum production of fry, providing quality of the fry is maintained.

The returns of adult sockeye to the Weaver Creek and Upper Pitt channels in 1974 provided further evidence of the effectiveness of the installations. The run to Weaver Creek in 1974 was 304,000 sockeye, not including jacks. This was the largest run ever recorded on this cycle, and the second largest run in 23 years of records, the run in 1973 being the largest (Figure 2). The catch from the run was 236,000 fish, of which 198,000 were produced by the channel.

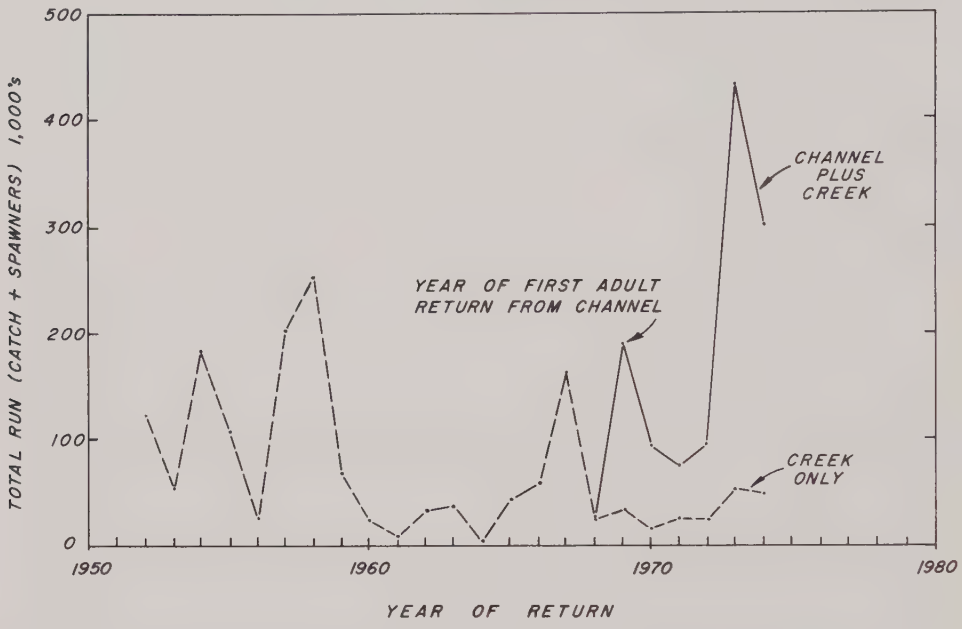

Figure 2. Sockeye Production from Weaver Creek and Weaver Creek Channel.

The channel has produced 992,000 adult fish in the years 1969-74, compared to 204,000 produced from the natural spawning grounds in Weaver Creek during the same period from over twice as many spawners. The average annual return in these years has been 175,000 sockeye, 1.5 times greater than the average of 118,000 during the best period of natural production from 1952 to 1960. On the basis of these results, the channel has definitely accomplished the objective of restoring the Weaver Creek run.

For the first five years of complete return, production per spawner, expressed in terms of 1,000 eggs potential deposition, has been 11.5 times greater in the channel than in the creek as shown in the following table. Production of 4-year-old returns from the 1970 brood was 4.11 fish per 1,000 eggs in the creek and 22.69 per 1,000 eggs in the channel, the second highest rates of return since the channel started operating. Annual benefits to fishermen have averaged 10.3 times more than the average annual cost of the channel, including interest and depreciation.

AVERAGE RETURN PER 1,000 EGGS POTENTIAL DEPOSITION
WEAVER CREEK RUN

Brood Years	*Weaver Creek*	*Weaver Channel*
1948-64	2.19	Not in Operation
1965-69	0.95	10.97

The run to Pitt River in 1974 was 76,000 sockeye, 77% of this being 5-year-old fish from the 1969 spawning. The catch from the run was 55,655 sockeye, of which 31,971 were produced by the incubation channel. The channel has produced returns of 470,000 sockeye in the years 1967-74, compared to 300,000 produced from the natural spawning grounds from eight times as many eggs (Figure 3). The average return

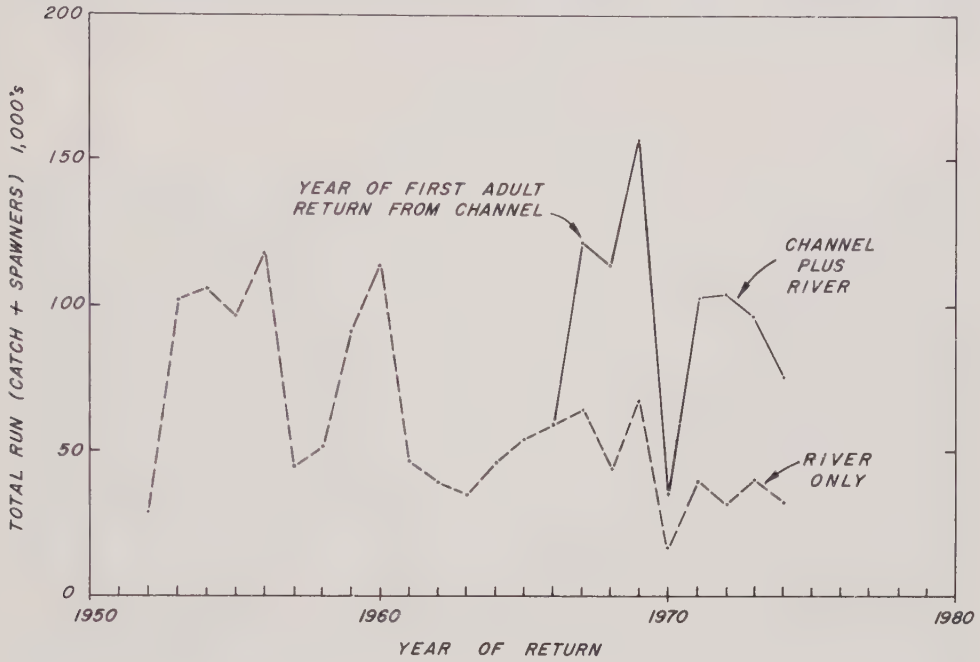

Figure 3. Sockeye Production from Pitt River and Pitt River Incubation Channel.

of 96,600 annually during these years was 20% more than the average of 80,000 annually during the best period of natural production from 1952 to 1961. This channel has also achieved the objective of restoring the Pitt River run. For the first seven years of complete return, production per 1,000 eggs in the incubation channel has been 12.4 times greater than in the natural river spawning grounds, as shown in the following table. Production rate for the 1970 brood returns in 1974 was low, as most of the return is expected as 5-year-old fish in 1975. The channel has produced benefits to fishermen averaging 8.8 times greater than the average annual cost of the channel.

AVERAGE RETURN PER 1,000 EGGS POTENTIAL DEPOSITION
UPPER PITT RIVER RUN

Brood Years	*Upper Pitt River*	*Incubation Channel*
1948-62	1.31	Not in Operation
1963-69	1.50	18.61

The 1,645 sockeye returning to the Gates Creek channel in 1974 were primarily jacks from the 1971 brood year, but 64 adult sockeye returned from the seven effective female spawners in 1970. The 1970-74 cycle is the smallest of the four cycle years at Gates Creek and 91% of the adult return of 70 fish was diverted into the channel. Production from the channel has averaged 10.06 adults per 1,000 eggs or 5.8 times greater

than the production of 1.73 per 1,000 eggs potential deposition from the natural spawning grounds. As mentioned in the 1973 Annual Report, it is believed the Seton Creek hydroelectric plant has caused a loss of Gates Creek sockeye en route to their spawning ground. Thus, production of the run has not been fully accounted for. This factor, and the low egg to fry survival of the 1969 brood because of silt accumulation in the channel, has contributed to the lower relative production rate than recorded at the Weaver Creek and Upper Pitt River channels.

REHABILITATION

During the spring of 1974 a further check was made on the progress of the transplant of sockeye eggs made to the Lower Horsefly River in the fall of 1972. Details of the transplant were given in the 1972 Annual Report. Fry from this transplant were captured moving down the Horsefly River between June 1 and June 8 of 1973, but enumeration was not possible because of freshet conditions in the river. However, from sampling of the redds it was estimated that 791,000 fry were hatched from the 1,020,000 eggs planted. It was expected that this population would appear at the outlet of Quesnel Lake as smolts in the spring of 1974. Sampling gear was operated at the lake outlet during the expected migration period from April 18 to May 16, but no smolts were seen or captured. However, fishing camp operators and other residents at the lake outlet reported large numbers of smolt-sized fish showing on the surface of the river on June 4, with lesser numbers on June 5 and 6. These people have observed sockeye smolt migrations in previous years and reported the behaviour of the fish seen in 1974 was similar to that of sockeye migrations in other years. Smolt-sized fish were also noted in the stomachs of fish caught by sports fishermen. Since there are no other known stocks of fish that would produce such a migration, it is assumed they were smolts from the 1972 egg plant. The next opportunity to check on the population will be the return of jacks in 1975.

Historical records indicate that Adams Lake and Upper Adams River at one time supported a substantial summer sockeye run. As a result of the combined effect of a logging splash dam at the outlet of Adams Lake and the obstruction at Hell's Gate, the run became extinct. It is not possible to determine the size of the run from the early records, but data on the rearing capacity of Adams Lake suggest that the lake could support a population that would produce a catch of two million sockeye on the dominant cycle. Reestablishment of this population, therefore, would be a significant step in restoration of the sockeye runs to the Fraser. A transplant of eggs from the Seymour River to Upper Adams River in 1950 appeared to initiate a small run which returned 103 female spawners in 1954. The run increased to 146 female spawners in 1958, and then declined to 49, 32 and 2 female spawners in each succeeding cycle. In 1974 there were 11 female spawners. It is believed that the initial transplant plus the reinforcement in 1958 were not of sufficient size to produce a self-sustaining run. The eggs for these transplants were obtained from the summer sockeye run to Seymour River in the Shuswap system and were incubated to the eyed stage in a small tributary of Shuswap Lake near Seymour River. Recent findings (Brannon, 1972) indicate it would be preferable to incubate the eggs entirely in Upper Adams River water. In August 1974, the Commission flew 1,551,000 eggs from the Seymour River to a

Brannon, E.L. 1972. Mechanisms Controlling Migration of Sockeye Salmon Fry. Int. Pac. Salmon Fish. Comm. Bulletin XXI

mobile incubation station set up on the Upper Adams River. The eggs were incubated in trays until they were eyed, and at the end of October, 1,374,000 were planted in the Upper Adams River in the same vicinity as the earlier transplants. Since the Seymour River will have a large enough run in 1975 to supply sufficient eggs, the operation will be repeated in 1975 to give a start on two cycles.

RESEARCH

The absence of adult pink salmon runs to the Fraser River system in even numbered years has puzzled fisheries scientists for many years. Attempts to establish runs by transplants of eggs from other river systems having pink runs on even years have not been successful. Recent technological developments have suggested three possible new approaches to the problem which could have better success. One approach would involve advancement of maturity in pink salmon by one year, and utilization of the sperm to fertilize eggs obtained from an even year stock. This would provide at least part of the gene pool from a Fraser River stock. A second approach would involve preservation of sperm from Fraser River male pink salmon from one year to fertilize eggs from an even year stock. This also provides part of the genes from a Fraser River stock. A third approach would involve retardation of a pure Fraser River stock by one year by photoperiod control to reach maturity in an even year at three years age. This approach would take longer than the others but has the advantage of providing all genes from a Fraser River stock. After consideration of various aspects of the three possibilities, the Commission selected the latter approach. Various locations were considered for obtaining the marine environment thought to be necessary. The Bamfield Station of the Western Canadian Universities Marine Biological Society offered a number of environmental advantages as well as support facilities, and agreement was reached with the Society for provision of space and utilities.

The objective of the Commission's research is to have 750 males and 750 females reach maturity at three years' age in 1976, from which approximately one million eggs could be obtained for planting in a spawning channel at Seton Creek. This number of eggs should produce sufficient adults to withstand natural losses and fishery harvest and obtain enough spawners to return or increase the initial one million eggs.

In May 1974, 45,000 pink fry were taken at Seton Creek, and 30,000 were flown to the seawater rearing tanks that had been installed at the Bamfield Station. The other 15,000 were flown to fresh water facilities at the Sweltzer Creek Research Laboratory. This latter group would be reared in the same manner as the sea water group at Bamfield and were intended as backup for the main experiment at Bamfield. The selected diet for both groups was Oregon moist pellet and fresh shrimp, the latter being included to provide fatty acids thought to be necessary for production of viable eggs and sperm. Reduction in numbers of fish being reared would be required at intervals to keep the loading in the rearing tanks to less than 0.5 pounds per cu ft. Losses in fresh water were high initially and 5,000 fingerlings were returned from Bamfield to the Sweltzer Creek Laboratory. By December there were 3,000 fish remaining in the fresh water group, and daily losses averaging six fish per day continued primarily because of a kidney infection. At Bamfield there were approximately 10,000 fingerlings remaining in December, losses having occurred from vibrio epizootic and fish that did not feed well. At that time, losses had been reduced about

three percent over a 70-day period and vibrio was being controlled by addition of antibiotic to the food. However, in a subsequent outbreak of vibrio, all the fish remaining were lost, with the exception of 60 that were transferred back to the Sweltzer Creek Laboratory for use as controls under natural lighting to observe the effectiveness of the diet. The experiment will continue with the fresh water group being reared at the Sweltzer Creek Laboratory.

In 1972, the release of 12,000 sockeye smolts from the research laboratory at Cultus Lake was reported. These fish were reared from eggs obtained from the 1970 spawning at Cultus Lake. When the fish were released they weighed an average of 14.6 gms and were three times heavier than the smolts from the wild population. There was no evidence of return of any of these fish as jacks in 1973. In 1974, scale samples were collected from adult sockeye during spawning at Cultus Lake to determine whether any of the hatchery reared smolts of the 1970 brood returned. Adult sockeye of hatchery origin were identifiable because freshwater circuli counts were far greater for hatchery than for wild fish. Analysis indicated a total 1974 run of 43,946 adult sockeye of Cultus Lake origin, of which 1,446 were of hatchery origin. Thus survival of hatchery smolts to adults was 12 percent. This is substantially greater than the 5.3 percent survival to adults for the 808,000 wild Cultus Lake smolts of the 1970 brood.

A total of 67,807 hatchery reared sockeye smolts of the 1972 brood were released in April 1974 and equaled 46 percent of the wild smolt migration from Cultus Lake. This is the second group of fish reared that have not had a problem with IHN infection. Hatchery smolts averaged 8.4 gms and were twice the size of wild smolts. Scale circuli counts were much greater for hatchery than for wild smolts, thus hatchery and wild fish can be differentiated by examination of scales. Scale sampling will be used again to evaluate returns of jacks in 1975 and adults in 1976.

A survey was carried out on five Fraser River sockeye populations in 1968 to determine if viruses were implicated in prespawning mortality of adult sockeye and at that time none were detected. Several scientists have isolated IHN virus from salmon populations in California, Oregon, Washington, British Columbia and Alaska. On the Fraser system it has been isolated from Cultus, Weaver and Chilko populations, and in 1974 it was found in the ovarian fluid of Adams River spawners. In the 1973 Annual Report, it was reported that IHN virus had been confirmed in sockeye fry at Chilko River. In the spring of 1974, 17 million smolts emigrated from Chilko Lake, indicating a survival of two percent from the eggs deposited in the brood year 1972. This is slightly lower than the 2.4 percent recorded for the 1970 brood, and is the lowest survival rate of the 21 years of record. It is not possible to determine how much the survival of the 1972 brood was affected by IHN, although on the basis of observations of dead and distressed fry, some reduction in survival due to IHN must have occurred. Since the 17 million smolts represent a normal survival rate from the 31 million fry in the spring of 1973, any losses probably occurred before the fry entered Chilko Lake. No evidence of IHN was seen during the 1974 fry migration at Chilko, and checks of the 1974 smolts for IHN virus were negative.

Investigations of factors influencing the survival of sockeye in Shuswap Lake continued during 1974. One of the concerns in recent years has been the low standing crop of zooplankton in the lake. Data from 1954 on has suggested, in four successive cycles, that in years following dominant runs (1954-74 cycle years) a decrease in zooplankton index occurred, presumably because of cropping by sockeye fry and finger-

lings of the dominant brood (Figure 4). This was followed by an increase in the zooplankton index by the next dominant cycle year. However, in 1968 the pattern changed, and the zooplankton index continued to decline, reaching the lowest recorded level in 1970. This change in pattern was cause for some concern. The index

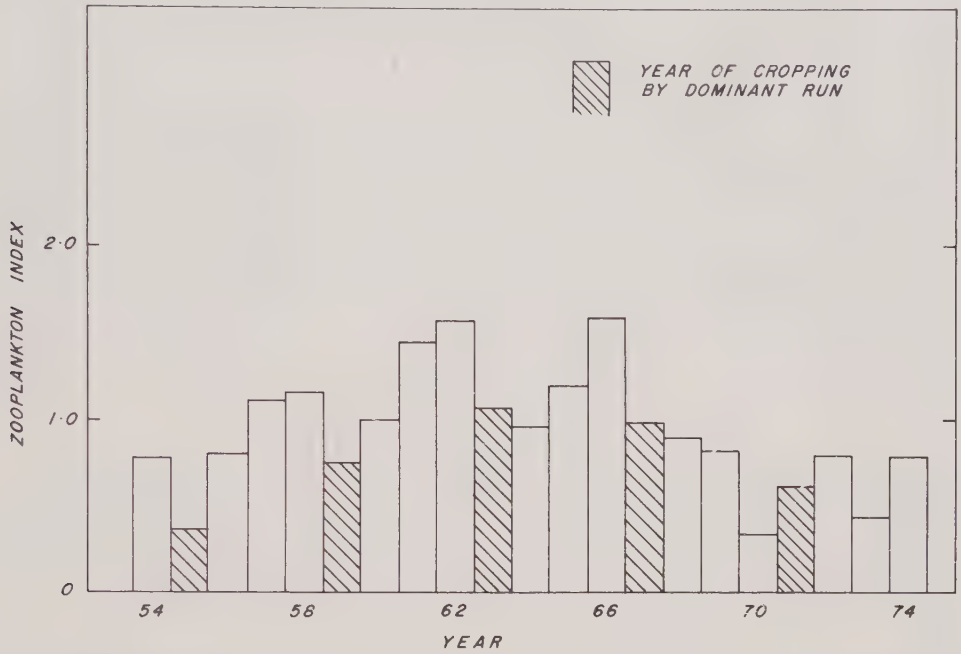

Figure 4. Mean Annual Zooplankton Index (ml settled volume) Shuswap Lake near Sorrento.

increased in 1971, the year the dominant sockeye population was rearing in the lake, and increased again in 1972. The abundance in 1973 was the lowest recorded in that cycle year, but in 1974 the index was about the same as in 1954. The reasons for the low zooplankton standing crop in these recent years are not known.

The excellent growth of the sockeye reared in the lake during these years suggests that there was a sufficient food supply for the numbers of sockeye present. However, data on survival rate for the brood year 1970-73 indicates conditions were not as favourable for the 1970 brood as for the succeeding three broods. The Commission has contracted with the Fisheries Research Institute, University of Washington, to make sonic surveys of Shuswap Lake in October to determine distribution of sockeye and to make population estimates. From these data estimates can be made of the survival from the calculated numbers of eggs deposited to the numbers of fingerlings a year later, as shown in the following table. The survival of two percent for the 1970 brood is low compared to the other years.

ESTIMATED SURVIVAL FROM EGGS DEPOSITED TO FINGERLINGS IN OCTOBER FOR SHUSWAP LAKE SOCKEYE

Brood Year	*Female Spawners*	*Percent Survival*
1970	850,000	2
1971	168,000	5
1972	3,600	5
1973	6,700	10

A comprehensive study of the sockeye runs to Adams and Little Rivers, which are the major populations rearing in Shuswap Lake, was started in the fall of 1974. The study is intended to monitor the survival of various stages of the life cycle of the sockeye from eggs in the spawners to smolts leaving Shuswap Lake, so that an assessment can be made of the relative magnitude of the losses that occur between various stages in a dominant cycle year.

During 1974 the Commission made sonic surveys of ten sockeye rearing lakes in the Fraser system during the summer months to estimate the numbers of sockeye. The estimates of numbers of fish present are made from a series of transects with an echo sounder. A midwater trawl has been used in some lakes to determine species composition of the fish located by the sounder, but it has not been possible yet to extend the trawling to all the lakes surveyed. Surveys during years of low sockeye abundance provide another means of estimating resident fish populations. This method was used at Shuswap Lake and will be used at other lakes also when more years of data are available. In the estimates obtained for 1974 given in the following table, the progeny of the 1973 dominant cycle runs to Quesnel, Stuart, Takla and Trembleur Lakes are evident.

FISH POPULATION ESTIMATES 1974
FRASER RIVER SYSTEM LAKES, MILLIONS OF FISH

Lake	*Date of Measurement*	*Estimated Fish Population*	*Estimated Sockeye Population*
Chilko	August 26	3.33	3.33
Francois	July 29	1.86	–
Fraser	July 27	4.83	–
Mara	July 17	0.85	–
Shuswap	July 17	9.84	2.95
Pitt	June 4	6.05	1.04
Quesnel	August 22	26.33	–
Stuart	September 27	18.05	–
Takla	September 24	21.51	–
Trembleur	September 26	8.35	–

All estimates are preliminary and subject to revision.

These lake surveys are a first step in the use of sonic methods to obtain estimates of sockeye smolt production from all the major rearing lakes.

The study of prespawning mortality of the Horsefly River sockeye run in 1973, undertaken jointly with the Vancouver Laboratory, Fisheries Research Board of Canada, continued during 1974. It is expected data analysis will be completed and reports prepared during 1975.

The examination of factors affecting sockeye production in Anderson Lake continued during 1974. Trawl catches in March 1974 showed that the juvenile sockeye remaining in Anderson Lake at that time were kokanee. Scale circuli obtained from kokanee in Anderson Lake showed five circuli for the first year and ten circuli for the second year, whereas scales from adult kokanee in Seton Lake showed 11.1 circuli for the first year and 23.1 for the second year. Kokanee in Anderson Lake were found to mature at five and six years of age at lengths of 25.4 and 26.3 cm, whereas in Seton Lake they mature at three and four years of age at lengths of 22.9 and 25.0 cm. These findings support earlier evidence obtained from examination of sockeye that growth

is much slower in Anderson Lake than in Seton Lake, despite the greater abundance of zooplankton in Anderson Lake. The reasons for the better growth in Seton Lake are still not known and further study is planned.

During 1974 the Commission engaged a scientist with expertise in the fields of oceanography and zoology to make a thorough study of factors in the estuarial and marine environments affecting the survival of Fraser River sockeye and pink salmon. The initial emphasis of the study has been on pink salmon, to examine the relationships presented in the 1973 Annual Report. These relationships were used as a guide in making predictions for the 1975 pink salmon return from the 292.4 million pink salmon fry that migrated out of the Fraser River in the spring of 1974. Because of early migration, below average condition factor of the fry, and very high runoff from the Fraser River during and after the fry migration, partially offset by above average oceanic conditions, it was predicted that survival from fry to adult would be 2.0 percent or less, well below the average of 3.1 percent for the past six cycles.

PROTECTION

The 1973 Annual Report summarized results of a study with Prince George Pulp and Paper Ltd. to determine whether consistent detoxification could be obtained by additional treatment. Based upon results obtained using a bench scale treatment system, a report of this study (Gordon and Servizi, 1974) recommended addition of an aerated lagoon capable of approximately 4.5 days treatment time to the present 24 hour activated sludge treatment facilities. The report also recommended addition of primary sedimentation to assure that treatment capacity of the lagoon was not reduced by accumulation of solids originating in the combined effluent. There was evidence that soaps and black liquor were probably sources of high loadings during certain periods of the study. Therefore, in addition to out-plant treatment facilities, the report noted that in-plant facilities were required to lessen the occurrence of spills or other upsets which interfere with the biological detoxification process. However, a spill lagoon was recommended to absorb shocks of spills and upsets which escape in-plant control.

Prince George Pulp and Paper Co. Ltd. and Intercontinental Pulp Co. Ltd. acting jointly, reached conclusions similar to those above and planned a phased project to upgrade treatment at the two mills by the end of 1976. Initially, clarifiers will be constructed at each mill to remove settleable solids from selected wastes. Construction of an aerated lagoon designed to give 4.3 days treatment for combined effluents from the two mills will complete the project. Combined effluent from the aerated lagoon will be discharged through a new diffuser in the Fraser River. A spill pond will be retained at each mill to receive shock loads.

Northwood Pulp and Timber Co. Ltd., also located at Prince George, recognized that additional treatment was required to obtain dependable detoxification of effluent and in 1973 the Company initiated construction of an aerated lagoon to provide 5-day treatment for all effluents. This lagoon became operational in late 1974.

When the proposed projects are completed, each of the five kraft pulp mills in the Fraser River watershed will have out-plant treatment consisting of primary sedimentation, biological oxidation for 4 to 5 days in an aerated lagoon and a spill pond to

absorb shock loads. These facilities represent significant steps in upgrading the shorter term treatment previously used by the mills at Prince George.

Although out-plant treatment is necessary, in-plant control processes can reduce the total load to be treated, lessen occurrence of shock loads and be of benefit to mill operation. Completion of a cooling tower for recycled process waters at the Weyerhaeuser mill at Kamloops is expected to reduce water consumption and effluent volume. At Prince George, B.C. Chemical Co. has built a plant to process resin acid soaps into by-products. The plant is directly connected to the Prince George and Intercontinental pulp mills and residuals remaining after extraction of by-products are returned to the Intercontinental mill for burning in the recovery furnace. As a consequence of this connection with the pulp mill, the chemical plant is planned to be effluent free. In addition, control over resin acid soaps in the two mills is expected to lessen the possibility of shock loads in the aerated lagoons.

Effluents from bleached kraft pulp mills have a strong tendency to foam during biological treatment in aerated lagoons owing to agitation by mechanical surface aerators. Aerated lagoons have baffles to prevent direct discharge of foam but collapsed foam can enter the effluent. Studies were undertaken in cooperation with the Pacific Environment Institute to describe the constituents, toxicity and detoxification of foam. Bioassays established that foam collected from two lagoons was highly toxic to juvenile sockeye salmon. Studies to identify substances responsible for toxicity in foam from each lagoon and to determine capacity of biological treatment to detoxify foam are continuing.

Biological treatment processes require adequate amounts of various inorganic nutrients to support the microbiological populations responsible for treatment. Nitrogen and phosphorous are known to be key nutrients and in some cases these substances must be added to industrial wastes to insure satisfactory treatment. Pulp mill effluents have generally been considered deficient in nitrogen and phosphorous and it has been common practice to add these substances to aerated lagoons. The amounts added vary considerably and it is doubtful that the minimum amount commensurate with satisfactory treatment has been determined. Since nitrogen and phosphorous discharged from an aerated lagoon are added to that present naturally in the receiving water, and since excessive amounts of nutrients stimulate excessive growth of algae, minimizing the amounts added to aerated lagoons is a worthy objective. In this regard, it is noteworthy that by year-end addition of phosphorous was eliminated at the Weyerhaeuser pulp mill in Kamloops and amounts of nitrogen were significantly reduced. Furthermore, there were indications that the aerated lagoon would operate for extended periods without supplementary addition of either nitrogen or phosphorus.

Cariboo Pulp and Paper at Quesnel announced plans for a major expansion but these were deferred to a future time.

A federal-provincial task force continued studies of color, foaming and algal growths in the Thompson River and Kamloops Lake. Studies to determine causes of foam were continuing. Part of the task force project included sampling of the Thompson River for macroinvertebrates by the Commission using methods and stations established during baseline studies in 1964 and 1965. Macroinvertebrate populations are believed to be indicators of water quality. Variability in numbers of macroinverte-

brates at control and monitoring stations was similar to that noted during baseline studies. Further sampling was planned to complement other studies being conducted by the task force.

Survival of 1973 brood pink salmon from egg to fry in the Upper Thompson River where heaviest growths of algae occurred in spring 1973 was measured by the Commission. Pink salmon escapement, spawning success and egg deposition in autumn 1973 were typical for the Thompson River. Based upon catches in the spring 1974, fry emergence from the nine miles of spawning grounds downstream of Kamloops Lake was calculated as 44,269,000 giving an egg to fry survival of 26.9 percent. This value is considerably higher than average for egg to fry survival for natural spawning grounds in the Fraser River system taken as a whole. Overall, egg to fry survival appeared unaffected by the benthic algae growth experienced in the Thompson River in 1973-74. Comparable measurements have not been made previously in the Thompson River, but with such a high survival rate indicated for 1973-74, a reduction from earlier years seems improbable

The monitoring program in Kamloops Lake conducted by the Weyerhaeuser Canada pulp mill continued during 1974. Plankton samples collected by the Company were forwarded to the Commission for measurement using methods applied to samples from throughout the watershed.

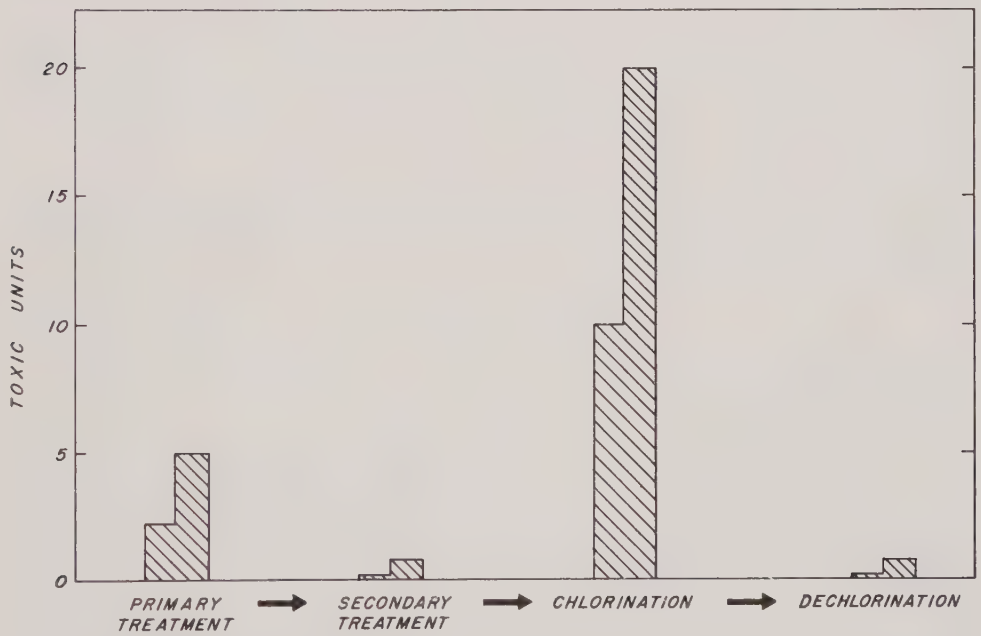

Figure 5. Range of Relative Toxicity of Sewage Effluents for Different Steps of Treatment.

Studies of municipal sewage toxicity and treatment continued. The 1973 Annual Report mentioned that studies were planned to test the practicality and effectiveness of full-scale chemical dechlorination as a method of removing toxicity induced by chlorination of sewage. The project was conducted at Lulu Island primary sewage treatment plant on the lower Fraser River in cooperation with the Greater Vancouver Sewerage and Drainage District and the Department of Environment. The Sewerage

and Drainage District installed a sulfur dioxide system to dechlorinate the entire flow of the treatment plant. Performance of dechlorination was evaluated chemically by testing for residual chlorine and biologically by continuous flow bioassays of young sockeye. The tests demonstrated that chlorine induced toxicity could be removed effectively with sulfur dioxide (Figure 5). Complete details of this study will be presented in a Commission Progress Report.

Municipal sewage contains a mixture of substances of domestic, commercial and industrial origin which are toxic to aquatic life. Treatment by sedimentation, commonly termed primary treatment, removes settleable solids but soluble toxic constituents remain. Since sewage characteristics may vary from one treatment plant to another, a study was conducted to compare acute toxicity of sewage from three primary sewage treatment plants operated by Greater Vancouver Sewerage and Drainage District. The results of this study are being compiled in a Commission Progress Report.

There is substantial evidence from these studies and from reports in the literature showing that primary treated sewage is toxic to salmon and other fish with a relative toxicity of 2.5 to 5 units. Reports in the literature show that secondary treatment by the standard rate activated sludge process effectively removed toxicity from sewage (Figure 5), providing an effluent with zero to 0.8 units of toxicity.

The British Columbia Pollution Control Board ordered the Greater Vancouver Regional District to upgrade the Annacis Island sewage treatment plant, now under construction, from primary to secondary treatment. The GVRD appealed this order to the provincial government acknowledging the need for secondary treatment but questioning timing of its installation. The Commission collaborated with the Department of Environment in preparation of a position paper supporting secondary treatment to remove toxicity inherent in sewage, followed by dechlorination to remove toxicity introduced by chlorination. No decision concerning the appeal was announced during 1974.

A proposal to expand a ski development on Sakwi Creek, upstream of the Weaver Creek spawning channel, into a major resort area with associated sewage disposal system caused concern about maintenance of suitable water quality in Weaver Creek. Discussion of the problem was continuing at year end.

The study of a prospective second stage of the Nechako-Kemano project by British Columbia Hydroelectric and Power Authority continued during the year. The Commission participated with the Fisheries Service, Department of Environment and the British Columbia Fish and Wildlife Branch in studies financed by B.C. Hydro. The Commission's activity centered on collection of data on the Nechako River between Kenney Dam and Prince George for use in calculating changes in water temperature that could be expected if the additional diversion of water from the Nechako is made. The possibility of occurrence of conditions harmful to salmon as a result of nitrogen supersaturation was also investigated.

New developments are being proposed and old proposals are being reexamined for various projects that could affect sockeye and pink salmon in the Fraser River watershed. A proposed subdivision adjacent to Gates Creek upstream of the spawning channel is being examined. An oil company proposed construction of an oil refin-

ery in the lower Fraser River area. The B.C. Petroleum Corporation is also considering various sites for a large oil refinery. B.C. Hydro is reexamining the thermal power possibilities of the Hat Creek coal deposits which lie between the Fraser and Thompson Rivers southwest of Ashcroft. Careful study of these proposals will be required to evaluate potential effects on sockeye and pink salmon, and to make recommendations that will ensure that these species are protected. As in the past, the Commission will be working closely with the Fisheries Service and Environmental Protection Service on these studies.

Feasibility studies were being made by the B.C. Government and Japanese interests for a steel mill and related complex which in its first phase would produce two million tons of steel per year on a site of at least 1,500 acres. The Lower Mainland was one of the sites considered initially but was later dropped from consideration.

During 1974 about 160,000 gallons of crude oil from a ruptured pipeline entered the Salmon River, a tributary of the Fraser north of Prince George, and traveled downstream, reaching Hope on May 17. Oil was not easily seen upstream of Lytton but small patches were visible in the Fraser and along the shoreline about six miles west of Hope. Oil was evident on the upstream side of an oil boom placed at about seven miles west of Hope but was not seen downstream of the boom. Surface water samples collected at the oil boom and points upstream as far as Lytton were not toxic and did not cause outward signs of stress to juvenile sockeye during bioassays. Wild sockeye smolts captured at Mission during routine sampling on May 17 were examined internally and externally and found free of oil particles. The available information indicates that sockeye and pink salmon were not adversely affected by the amount of oil lost.

Through cooperative arrangement with the Fisheries Service and Environmental Protection Service, Canada Department of the Environment, numerous applications for effluent discharge permits, placer mining leases, water licences, dredging, gravel removal and construction on waterways were reviewed, and recommendations for protection of sockeye and pink salmon were made.

Study of the passage of Gates Creek and Portage Creek sockeye at the Seton Creek hydroelectric project continued during 1974 in cooperation with B.C. Hydro. In October at the peak of passage of the Portage Creek run, there was much concern that the number of fish moving through the fishway at the dam on Seton Creek was much lower than anticipated from the estimated escapement past the commercial fishery. With the cooperation of B.C. Hydro, the turbine was shut down and two divers entered the draft tube. Many decapitated sockeye were found in the tailrace and deep within the draft tube the divers encountered a mass of live sockeye. The fish probably were attracted into the draft tube while the turbine had been operating at low load or during the shutdown, and some had been decapitated in attempting to swim through the turbine. After complete shutdown of the flow of water and draining of the penstock, the fish left the tailrace and a substantial increase in passage through the fishway occurred the next day. The observations confirm previous deductions that the sockeye have difficulty at the powerhouse tailrace. The findings of the past two seasons of study at the installation will be utilized as a basis for recommendation for remedial measures. It is expected that these recommendations will be finalized during 1975.

In the 1969 Annual Report the Commission detailed its concern about changes in the distribution of flow between the two major channels of the Adams River where it is divided by islands. In April 1969 the flow to the right channel was only 40 cfs, compared to 400 cfs in the left channel. This was a reversal of the distribution observed in 1950 when about two thirds of the flow was in the right channel. The Commission was concerned about exposure of eggs in the right channel and consequent loss of production from a major part of the spawning ground. Prior to the arrival of the dominant run in 1970, several channels were opened up to supply more flow to the right bank channel, and after this was done the right channel received about 48 percent of the flow. It was hoped the changes made would promote a permanent shift in the flow distribution at the channel division. However, this has not been the case. The river has continued its erosion pattern with resulting greatly increased flows to the left channel. By March 1973 the flow in the right channel was reduced to 21 percent of the total. Despite this, in October 1973 there were more jacks in the right channel than in the left, indicating a continued preference for the right channel. In view of these changes the Commission considered more permanent measures should be taken to control the division of flow. Approvals were obtained for the construction of two rock groins which would follow the line of the left bank shore as defined by surveys made in 1950. This work was started at the beginning of September this year. However, after the upstream groin was completed, it was evident that very substantial changes in flow pattern and distribution had been caused already. It was felt that a cautious approach should be taken and the second groin was not constructed. The work was completed before mid-September (Figure 6), well in advance of the arrival of the 1974 run. The sockeye spawners were evenly distributed throughout both left and right channels at the peak of spawning, and in November the river flow was divided 56 percent to the right channel and 44 percent to the left channel. Detailed study of egg survival during the winter will be made as part of the overall study of the 1974 Adams and Little River populations.

Figure 6. Aerial view of remedial work completed on Lower Adams River in 1974.

Study of the Nadina River system in relation to proposed logging plans was started during the year. The Commission obtained detailed aerial photography of the river as a base for studying conditions of the spawning grounds used by the Early Nadina run. Gravel samples were also obtained from selected portions of the spawning grounds to determine particle gradation. These data will be used to plan possible remedial measures to stop the decline of the early run evident in the following table.

EARLY NADINA SOCKEYE SPAWNERS

1950	1,908	1951	114	1952	1,023	1953	19,050
1954	1,449	1955	90	1956	1,181	1957	29,994
1958	169	1959	344	1960	1,521	1961	18,883
1962	447	1963	1,003	1964	1,395	1965	3,884
1966	83	1967	1,595	1968	902	1969	8,541
1970	93	1971	1,222	1972	827	1973	2,705
1974	0	1975		1976		1977	

The Nadina #2 spawning channel proposed in the Development Program recommended by the Commission in 1971 was intended in part to prevent the loss of the Early Nadina run, which has been declining since about 1957. In view of the continuing delay in implementation of this program, it is hoped that the in situ gravel cleaner referred to in the report on Engineering activities can be utilized for the necessary remedial action.

Preliminary studies were also undertaken on the Thompson and Nicola Rivers to determine the feasibility and possible economic benefits of stream improvements such as gravel cleaning for increasing the productivity of existing spawning areas.

ENGINEERING

Funds provided in the 1974-75 fiscal year for construction were utilized for projects involving protection of spawning grounds, maintenance and improvement of existing facilities, rehabilitation and research. Reference has already been made in this report to the protective measures undertaken on the Lower Adams River and the studies made on the Nadina River.

Maintenance at Hell's Gate involved replacement of the timber stiffening trusses and deck of the vehicle suspension bridge over the Fraser River built in 1949. The timber truss was badly deteriorated and was replaced with a welded steel truss.

At the Nadina River spawning channel, an auxiliary fish entrance was constructed to improve attraction of sockeye to the channel. The entrance was part of the original plan which was deleted from the final construction pending testing of the main entrance and demonstration of need for the auxiliary entrance. Crew cabins were also constructed for the use of the relief operator and seasonal employees at the Nadina channel and the Weaver Creek channel and a crew cabin for the Middle River area was purchased and stored for installation during 1975. At the Sweltzer Creek Research Laboratory a second caretaker residence was provided, and a boat, trailer and net storage shed was built. Two trailers for seasonal crew accommodation were also purchased.

Facilities for incubation of up to two million eggs were purchased and installed in a trailer and were operated for two months at the Upper Adams River. An electronic fish counter was purchased and installed in the fishway at the Seton Creek dam to test performance of the new equipment with a view to possible application at Hell's Gate fishways. Facilities for the research on production of even year pink salmon from Fraser River stock were constructed at Bamfield, under agreement with the Western Canadian Universities Marine Biological Society. Details of this investigation are given in the Research section of this report.

Investigations of machinery suitable for in situ cleaning of gravel in natural spawning grounds led to field testing in Cascade Creek, tributary to Stave Lake. The equipment produced a clean gravel overlay of 12 to 14 inches depth with 0.8 percent of material less than ½ inch. Further development and testing is planned in 1975 to improve mechanical features and to increase the depth of cleaning.

TABLE I

SOCKEYE CATCH BY GEAR

Gear		1962	1966	1970	1974
United States Convention Waters					
Purse Seines	Units	225	187	191	272
	Catch	505,028	783,466	779,271	1,515,444
	Percent	66.57	58.59	57.72	61.56
Gill Nets	Units	395	384	492	1,140
	Catch	192,078	496,295	504,873	873,595
	Percent	25.32	37.11	37.39	35.49
Reef Nets	Units	64	40	41	54
	Catch	60,694	57,086	65,644	72,408
	Percent	8.00	4.27	4.86	2.94
Troll	Catch	837	368	429	228
	Percent	0.11	0.03	0.03	0.01
TOTAL CATCH		758,637	1,337,215	1,350,217	2,461,675
Canadian Convention Waters					
Purse Seines	Units	74	77	87	202
	Catch	165,062	405,585	441,120	1,044,742
	Percent	19.73	30.04	28.61	41.79
Gill Nets	Units	1,430	1,484	1,263	1,000
	Catch	660,577	922,831	955,178	1,029,678
	Percent	78.98	68.35	61.95	41.19
Troll	Catch	10,760	21,738	145,473	425,599
	Percent	1.29	1.61	9.44	17.02
TOTAL CATCH		836,399	1,350,154	1,541,771	2,500,019

NOTE: Gear counts represent the maximum number of units delivering sockeye on a single day near the peak of the run.

Table II

CYCLIC LANDINGS AND PACKS OF SOCKEYE FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1974			
Total Landings (No. Sockeye)	2,461,675	2,500,019	4,961,694
Share in Fish	49.61%	50.39%	
Total Pack (48-lb Cases)	242,291	248,050	490,341
Share in Pack	49.41%	50.59%	
1946-1974			
Total Landings (No. Sockeye)	49,231,201	48,934,376	98,165,577
Share in Fish	50.15%	49.85%	
Total Pack (48-lb Cases)	4,341,487	4,297,220	8,638,707
Share in Pack	50.26%	49.74%	
1974 *Cycle Catch*			
1974	2,461,675	2,500,019	4,961,694
1970	1,350,217	1,541,771	2,891,988
1966	1,337,215	1,350,154	2,687,369
1962	758,637	836,399	1,595,036
1958	5,257,316	5,241,617	10,498,933
1954	4,806,258	4,722,463	9,528,721
1950	1,220,893	894,469	2,115,362
1946	3,551,310	4,240,198	7,791,508
1942	2,935,192	5,047,599	7,982,791
1938	1,408,361	1,900,220	3,308,581
1934	3,590,058	1,430,300	5,020,358
1930	3,544,718	1,043,318	4,588,032
1926	469,900	912,566	1,382,466
1922	513,848	580,144	1,093,992
1918	569,094	242,275	811,369
1914	3,555,890	2,137,177	5,693,067
1910	2,765,726	1,690,091	4,455,817
1906	2,030,550	2,066,604	4,097,154
1902	4,001,717	3,177,538	7,179,255

NOTE: Pack figures include all sockeye landed even though some were sold fresh and frozen.

TABLE III

DAILY CATCH OF SOCKEYE, 1962-1966-1970-1974 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1962	1966	1970	1974	1962	1966	1970	1974	1962	1966	1970	1974
1					25,695	131,250					31	
2					16,883	104,089					6	
3						104,338	79,718		142			55,431
4		CLOSED				56,763	43,413		897			
5						73,479	35,355		553	8,986		
6					32,790				37,491	4,292		
7					33,759			234,490	17,758	9,196	549	
8					42,145	76,199		142,942		4,756	301	
9						66,840					671	12,421
10						40,168	70,672		331		275	6,988
11		2,317				45,066	55,718		4,921			5,044
12		1,968				51,407	59,364	105,239	5,584	3,262		
13			4,133		41,499	26,894	67,530	139,059	542	980		
14			1,716		13,444		48,662	103,232		1,686	11,940	
15	CLOSED			8,175		44,307		154,957		511	2,356	
16				1,776		43,556	67,087				1,373	11,730
17						51,893	89,253				168	4,321
18		6,902				22,143	94,580		452		1,722	1,450
19		6,154				17,494	73,372		1,337	8,131		
20			14,399		30,235		52,020	310,026	160	11,012		
21			10,630		52,410			216,732		12,804	792	
22			14,252	4,661		73,061		158,644		6,364	258	
23	11,312		9,783	3,997		94,884					2,634	1,442
24	12,930										3,842	504
25	22,666	28,951							92		802	262
26	25,538	34,784						308,214	800	145		
27		41,679	47,077				234,354	238,166	93	186		
28			33,591				91,263			33	1,305	
29			11,710	100,429	183,264					8	1,094	
30	53,588			75,587		11,044				30	923	
31	33,591			55,127	52,971	6,457	49					
Totals	159,625	122,755	147,291	249,752	525,095	1,141,332	1,162,410	2,111,701	71,153	72,382	31,042	99,593
Troll	388	75	57	133	426	287	365	87	23		1	1
Monthly Totals	160,013	122,830	147,348	249,885	525,521	1,141,619	1,162,775	2,111,788	71,176	72,382	31,043	99,594
June, Oct. and Nov. Totals									1,927	384	9,051	408
Season Totals									758,637	1,337,215	1,350,217	2,461,675

TABLE IV

DAILY CATCH OF SOCKEYE, 1962-1966-1970-1974 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1962	1966	1970	1974	1962	1966	1970	1974	1962	1966	1970	1974
1						227,815					933	13,378
2	2,469			14,984		102,476					167,484	9,823
3	6,116					44,215	84,815		85,937			79,914
4		9,042				48,348	133,926		50,972			
5		9,990						64,383	8,832	438		
6					70,736				45,204	6,858		
7					20,880	134,957		194,503	1,806	174	107	
8				29,177		81,319		180,367		105	5,627	
9	22,160			5,701		57,790					61	112,839
10	11,310			9,000		76,573			53,283			1,271
11	11,328	9,714				55,376	231,605		624		8,248	
12		2,539				102,303	185,031		349	174	105	
13			5,562		5,801				173	16	139	135,407
14										511	239	
15				7,754	33,515	46,027		32,131				
16	12,460					44,504						1,405
17	12,708					48,046	94,112					1,712
18		8,073					103,304	147,866	148			
19		5,050						113,219	172	760		
20			9,883		39,664			199,353		71		
21			5,225		28,275					903		
22				4,838		70,477						
23	22,916			3,328		48,119						
24	7,351								725			
25		40,159						34,766	715			
26		15,177						88,440	784	530		
27			71,450				27,577	33,882		56		
28			45,779		50,144		4,850	235,993		7,668	150,254	
29			21,227	84,653	26,674							
30	68,666			94,877	33,735	1,689						26,041
31	18,324			103,943	25,720	7,233	1,975					
Totals	195,808	99,744	159,126	358,255	335,144	1,197,267	867,195	1,324,903	249,724	18,264	333,197	381,790
Troll	790	2,603	11,353	49,208	4,417	18,950	134,009	368,553	291	35	51	7,814
Spring Salmon Gill Nets			1,025		1,424	2,970	5,222		1,540	3,810		
Monthly Totals	196,598	102,347	171,504	407,463	340,985	1,219,187	1,006,426	1,693,456	251,555	22,109	333,248	389,604
May, June, Oct. and Nov. Totals									47,261	6,511	30,593	9,496
Season Totals									836,399	1,350,154	1,541,771	2,500,019

TABLE V

INDIAN CATCH OF SOCKEYE BY DISTRICT AND AREA, 1970 and 1974

District and Area	1970 *Catch*	1970 *No. of Fishermen*	1974 *Catch*	1974 *No. of Fishermen*
HARRISON-BIRKENHEAD				
Birkenhead River and Lillooet Lake	6,400	43	11,550	16
Harrison and Chehalis	600	12		
TOTALS	7,000	55	11,550	16
LOWER FRASER				
Below Hope	27,390	108	71,894	155
TOTALS	27,390	108	71,894	155
MIDDLE FRASER				
Hope to Lytton	47,990	302	69,975	436
Lytton to Lillooet	6,520	50	7,875	200
Bridge River Rapids to Churn Creek	33,425	300	28,400	425
TOTALS	87,935	652	106,250	1,061
CHILCOTIN				
Farwell Canyon	700	20	3,190	
Hances Canyon	348	34	850	
Alexis Creek	1,029	26	855	137
Siwash Bridge	1,527	40	611	
Keighley Holes	302		1,350	
TOTALS	3,906	120	6,856	137
UPPER FRASER				
Churn Creek to Chimney Creek	1,800	78	1,280	
Soda Creek	500	39	1,150	163
Quesnel	325	27	1,475	
Shelley	107	21	366	24
TOTALS	2,732	165	4,271	187
NECHAKO				
Nautley and Stella Reserves	4,123	35	4,328	40
TOTALS	4,123	35	4,328	40
STUART				
Fort St. James	977	29	1,890	39
Tachie, Pinchi and Trembleur Villages	1,975	48	2,018	63
TOTALS	2,952	77	3,908	102
THOMPSON				
Main Thompson River	11,735	280	11,150	153
North Thompson River	750	33	30	2
South Thompson River	2,600	105	1,820	178
TOTALS	15,085	418	13,000	333
GRAND TOTALS	151,123	1,630	222,057	2,031

The Indian catch statistics detailed above are obtained from Canada Department of the Environment, Fisheries Service. Their officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.

TABLE VI

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1962, 1966, 1970, 1974

District and Streams	1974 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1962	1966	1970	1974		Males 4-5 Yr.	Female 4-5 Yr
LOWER FRASER								
Cultus Lake	Nov. 20-25	27,070	17,464	15,149	9,814	830	3,630	5,35
Upper Pitt River	Sept. 10-14	16,585	20,867	6,657	20,792	211	11,681	8,90
Widgeon Slough	Oct. 30-Nov. 2	599	884	364	1,643	11	900	73
HARRISON								
Big Silver Creek	Sept. 20-24	490	329	261	837	59	343	43
Harrison River	Nov. 12-15	8,162	32,672	12,675	16,920	0	8,211	8,70
Weaver Creek	Oct. 15-22	15,962	20,416	11,096	66,807	2,714	27,067	37,02
LILLOOET								
Birkenhead River	Sept. 26-Oct. 1	52,146	81,134	72,760	173,463	53,826	31,224	88,41
SETON-ANDERSON								
Gates Creek	Aug. 30-Sept. 10	1,046	592	803	1,791	1,721	23	4
Portage Creek	Nov. 1-5	12,034	31,844	3,901	8,986	511	3,508	4,96
SOUTH THOMPSON								
Seymour River	Aug. 28-Sept. 2	58,104	28,754	14,375	45,189	601	18,459	26,12
Eagle River	Sept. 1-5	169	338	23	263	5	107	15
Scotch Creek	Aug. 28-Sept. 2	7	459	304	464	17	155	29
Anstey River	Aug. 30-Sept. 3	77	—	196	666	9	272	38
Upper Adams River	Sept. 5-10	85	63	4	13	0	6	
Lower Adams River	Oct. 15-17	991,728	1,197,336	1,297,990	889,613	5,357	398,148	486,10
Little River	Oct. 21-23	67,398	55,952	168,881	122,112	571	36,944	84,59
South Thompson River	Oct. 21-23	14,441	4,313	5,931	14,466	132	4,896	9,43
Lower Shuswap River	Oct. 12-15	31,205	24,629	29,074	86,396	446	36,305	49,64
Middle Shuswap River	Oct. 18-22	457	1,872	4,559	3,064	16	1,287	1,76
Misc. Late Runs	Oct. 18-25	45,913	38,378	50,389	41,882	239	18,801	22,84
NORTH THOMPSON								
Raft River	Sept. 2-4	7,613	6,250	4,474	2,396	13	879	1,50
Barriere River	Aug. 26-30	14	4	2	4	0	2	
North Thompson River	Sept. 24	90	46	270	343	2	126	21
CHILCOTIN								
Chilko River	Sept. 22-29	92,467	226,702	145,049	128,131	18,568	36,569	72,99
Taseko Lake	—	657	353	Present	—	—	—	
QUESNEL								
Horsefly River	Sept. 6-10	1,001	1,607	1,350	4,459	0	1,846	2,61
NECHAKO								
Endako River	Sept. 1-5	236	5	0	34	0	17	1
Nadina River (Early)	—	450	83	93	0	0	0	
(Late)	Sept. 12-15	1,683	1,784	4,671	3,825	95	1,603	2,12
Stellako River	Sept. 30-Oct. 4	124,495	101,684	45,876	41,473	198	16,806	24,46
STUART								
Early runs								
Ankwil Creek	Aug. 8-11	290	86	220	707	2	305	40
Driftwood River	Aug. 5-9	374	140	1,983	2,462	8	1,061	1,39
Dust Creek	Aug. 8-11	1,035	178	963	1,214	4	523	68
Felix Creek	Aug. 2-6	1,600	979	2,866	4,161	13	1,793	2,35
5 Mile Creek	Aug. 7-11	11	0	108	349	1	150	19
Forfar Creek	Aug. 1-5	4,464	1,739	6,476	7,144	20	2,626	4,49
Frypan Creek	Aug. 8-11	243	58	130	470	1	203	26
Gluske Creek	Aug. 2-6	1,841	1,876	5,702	7,212	10	3,589	3,61
Kynoch Creek	Aug. 3-6	8,672	3,591	6,495	13,848	63	5,843	7,94
Narrows Creek	Aug. 1-5	666	322	144	632	2	272	35
Paula Creek	July 31-Aug. 4	405	0	565	2,677	8	1,154	1,5
Rossette Creek	Aug. 1-7	4,887	1,645	7,664	7,378	22	3,233	4,12
Sakeniche River	Aug. 8-11	20	2	0	66	0	29	
Sandpoint Creek	Aug. 7-10	243	0	358	779	2	336	44
Shale Creek	Aug. 6-14	306	50	34	449	1	194	25
Misc. Streams	Aug. 7-11	389	193	858	1,988	5	856	1,12
Late Runs								
Kazchek Creek	Sept. 18-22	77	144	74	239	7	108	1
Middle River	Sept. 18-22	11,706	4,917	12,115	8,990	274	4,111	4,66
Tachie River	Sept. 18-22	6,764	3,600	2,776	4,680	135	2,110	2,42
NORTHEAST								
Upper Bowron River	Aug. 27-30	6,292	2,480	1,341	1,850	0	804	1,04
TOTALS*		1,622,960	1,919,336	1,948,171	1,769,366	100,958	689,894	978,5

* Totals include small numbers of fish in small tributaries not listed in the table.

TABLE VII

DAILY CATCH OF SOCKEYE, 1959-1963-1967-1971 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1959	1963	1967	1971	1959	1963	1967	1971	1959	1963	1967	1971
1				1,068		112,848	83,010	9,704	23,297		17,852	79,685
2						72,265	94,322	145,517	18,812	1,282		60,079
3					51,046			94,802		1,032		87,853
4					91,067			53,159		47		56,222
5				12,708	89,417	81,546				10	11,025	1,411
6				8,111	139,733	48,585	5,594				11,025	87,582
7				9,281	167,337	29,274	88,268		5,401		6,254	69,145
8				4,588	132,596	18,439	58,194	7,447	10,197			33,948
9	CLOSED		251					155,896	7,266	28		
10			4,465		93,493			88,141	11,143	439		
11			3,762	1,714	124,278			58,076		421	2,548	
12				20,210	80,698	37,789		39,934			7,379	
13		CLOSED		17,672	74,075	12,228	152,217				4,728	
14				15,708		14,300	115,530	4,037			1,982	281
15				9,213			104,995	109,435	747			4,431
16			1,145				64,753	113,464	495			3,305
17			16,742		125,123			104,877	218			1,891
18			12,781	6,773	83,286			108,613		32	2,631	
19				56,405	64,087	6,193		76,550		6	604	175
20	7,112			45,037		4,269		50,385			515	1,163
21	5,962			37,835		2,680	189,061	547	154		198	980
22	5,008	33,394					197,978	112,368	99			594
23		110,105	5,072		942		156,371	93,858	56			
24		130,412	103,996		125,615		108,378	86,382	8			
25		94,278	74,382	16,459	67,372			55,063			11	
26		92,026	67,596	105,003	17,846	2,648		19,109			9	7
27	16,216	61,186	54,405	72,329	33,994	2,686					6	396
28	20,278			85,289		2,330			1,941			116
29	28,340	114,620		89,638		151	41,810		645			64
30	44,671	121,644	6,455				27,915	6,599	553	19		38
31		104,333	146,028		29,018		31,254	94,802				
Totals	127,587	861,998	497,080	615,041	1,591,005	448,231	1,519,650	1,688,765	81,032	3,316	66,767	489,366
Troll	437	240	143	122	4,188	203	34	190	27	1		6
Monthly Totals	128,024	862,238	497,223	615,163	1,595,193	448,434	1,519,684	1,688,955	81,059	3,317	66,767	489,372
June, Oct. and Nov. Totals									6,462	56	4,152	22,639
Season Totals									1,810,738	1,314,045	2,087,826	2,816,129

TABLE VIII

DAILY CATCH OF SOCKEYE, 1959-1963-1967-1971 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1959	1963	1967	1971	1959	1963	1967	1971	1959	1963	1967	1971
1				231			19,223	114,248	18,874			19,968
2				Strike			16,577	189,823	19,749	11,459		34,675
3				June 26-	15,439			113,015	6,740	8,062	2,170	124,765
4				July 10	16,614	91,288			1,581	10,160	29,490	16,483
5		CLOSED		953	5,000	70,820				106	27,699	20,106
6				915	Strike	54,485	73,831		3,831		476	50,720
7				850	July 26	44,820	184,860		7,269		639	
8				874	-Aug. 9	9,987	89,770		14,422		441	40,196
9	CLOSED				Incl.		114,059	288,641	27,728	15,879		46,210
10					228,536			188,407	31,362	57		36,579
11				39,111	145,352			198,973	306	12	55,886	32,316
12				16,037	125,006	59,034					37,370	27,253
13					127,041	27,942					793	3,514
14						8,205	183,161		24,349		318	18,537
15				12,044		5,783	129,684		22,769			18,225
16		784					104,460	190,798	16,543	4		
17		1,503	10,864		165,960			87,209	22,802	2		
18			8,744		83,683				18		650	
19			6,984	21,756	41,091	43,585					371	
20	10,360			13,361		13,553					208	391
21	8,871					3,146	115,565		19,365			167
22	12,214	3,757				3,979	76,188	60,261	10,636		50,985	16,238
23		6,900			55,943	1,955	36,132	86,106	19,305	15,557		7,811
24		22,877	47,625		104,920			16,933	15,459			
25		Strike	21,971		49,084					6	234	
26		July 12	27,672	187,654	32,174	11,487		142,151		0	115	22,579
27	4,672	To	26,691	40,513		15,557		100,315			108	2,315
28	2,540	Aug. 4		18,266		1,157	66,008		6			
29		19,241				1,276	24,586		2			6,281
30		21,981				590	5,799	173,063	1			2,812
31		47,394	92,491		31,096		4,370	54,019				
Totals	38,657	124,437	243,042	352,565	1,226,939	468,687	1,244,273	2,003,962	283,117	61,304	207,953	548,141
Troll	2,163	1,673	32,565	21,857	21,458	5,028	125,490	166,518	608	3,057	3,470	2,460
Spring Salmon Gill Nets	506	732	1,142	617					37	618		4,786
Monthly Totals	41,326	126,842	276,749	375,039	1,248,397	473,715	1,369,763	2,170,480	283,762	64,979	211,423	555,387
April, June, Oct. and Nov. Totals									8,398	21,145	17,547	13,392
Season Totals									1,581,883	686,681	1,875,482	3,114,298

TABLE IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1959, 1963, 1967, 1971

District and Streams	1971 *Period of Peak Spawning*	*Estimated Number of Sockeye*			
		1959	*1963*	*1967*	*1971*
LOWER FRASER					
Cultus Lake	Nov. 22-26	48,461	20,571	33,492	9,145
Upper Pitt River	Sept. 12-14	15,740	12,680	10,300	15,469
Widgeon Slough	Nov. 4-7	637	353	1,006	394
HARRISON					
Harrison River	Nov. 10-12	28,562	22,287	20,577	3,790
Weaver Creek	Oct. 15-18	8,379	14,469	22,617	5,575
LILLOOET					
Birkenhead River	Sept. 22-25	38,604	67,151	58,036	32,278
SETON-ANDERSON					
Gates Creek	Sept. 3-5	867	4,858	1,665	2,291
Portage Creek	Nov. 1-4	572	2,011	6,548	281
SOUTH THOMPSON					
Seymour River	Sept. 3-5	52,325	71,690	13,361	18,628
Lower Adams River	Oct. 12-15	113,230	151,373	765,161	269,127
Little River	Oct. 12-15	21,080	5,148	74,490	10,952
South Thompson River	Oct. 15-18	472	45	270	10
Lower Shuswap River	Oct. 20-24	0	23	5,951	6,117
NORTH THOMPSON					
Raft River	Sept. 6-8	10,210	8,724	1,303	840
Fennell Creek	Aug. 21-23	27	439	920	1,300
North Thompson River	Sept. 20-23	—	70	—	888
CHILCOTIN					
Chilko River	Sept. 24-28	470,621	1,002,252	176,337	174,266
Taseko River	Aug. 30-Sept. 1	16,410	31,667	5,700	10,500
QUESNEL					
Horsefly River	Aug. 30-Sept. 1	Present	86	119	171
NECHAKO					
Endako River	Aug. 30-Sept. 1	1,463	2,540	949	284
Nadina River (Early)	Sept. 1-3	351	1,019	1,595	1,222
(Late)	Sept. 15-18	1,013	7,304	7,790	14,525
Nithi River	Aug. 20-23	218	763	1,688	1,796
Stellako River	Sept. 25-27	79,355	138,805	90,680	38,768
STUART					
Early Runs					
Driftwood River	Aug. 5-8	3	14	52	335
Forfar Creek	Aug. 4-6	281	652	4,815	25,178
Gluske Creek	Aug. 3-5	97	0	1,368	14,305
Kynoch Creek	Aug. 5-7	1,123	2,147	6,694	22,932
Narrows Creek	Aug. 5-8	167	180	454	3,467
Rossette Creek	Aug. 2-5	911	1,600	6,566	16,454
Misc. Streams	Aug. 3-10	81	34	1,120	13,271
Late Runs					
Kazchek Creek	Sept. 12-14	7	364	92	40
Middle River	Sept. 15-18	3,500	1,838	972	485
Tachie River	Sept. 15-18	2,500	1,035	576	200
NORTHEAST					
Upper Bowron River	Aug. 24-27	29,247	25,144	31,695	25,497
TOTALS*		946,882	1,599,484	1,355,295	741,898

* Totals include small numbers of fish in small tributaries not listed in the table.

TABLE X

DAILY CATCH OF PINK SALMON, 1967-1969-1971-1973 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1967	1969	1971	1973	1967	1969	1971	1973	1967	1969	1971	1973
1		13	1		7,164		240	4,907	145,934		78,550	360,059
2		36		100	8,084		4,882			124,314	90,063	330,814
3				140		2,689	3,215			161,294	201,457	206,254
4				152		1,941	1,946				189,407	
5			9			2,099			362,417		4,666	
6			9		199				261,626		328,841	
7		23	20		6,635				144,223		390,632	
8		25	4		10,666		55	14,294		2,418	262,261	
9	2	33		1,067			7,185			8,677		294,472
10	29			1,496			7,161			127,783		169,530
11	39		1	2,615		3,627	5,042		157,616	57,856		66,887
12			43	3,581		1,783	4,649		149,560			
13			62	3,818	24,236	2,521			124,201			
14		443	111		41,126	2,081	344	22,253	89,874		6,114	
15		362	67		45,622		7,238	15,311		42,946	144,795	
16	10			5,661	53,414		7,552			19,249	121,411	
17	322			3,799			6,577			1,072	91,232	59,485
18	209		34	2,908		17,014	6,006		96,316			21,161
19			563			22,877	5,056		48,221		11,796	
20			514				3,154	62,583	39,802		59,887	
21		967	732		133,050		45	59,992	17,651		59,521	
22		547			191,662		7,257	43,693		16,381	33,525	
23	275	665		6,729	140,804		9,171	20,293		19,181		
24	6,873			5,110	172,829		12,231			11,860		6,891
25	6,010		112	4,251		98,003	13,107		943	5,347		3,242
26	5,622		2,033			119,947	11,680		769		1,212	
27	5,952		1,438					249,269	323		19,789	
28		2,080	2,391					138,583			6,741	
29		2,565	2,837		483,011					4,461	7,948	
30	3,897	1,259		6,821	366,854		5,580			2,265	6,865	
31	10,619			5,114	262,997		92,273					
Totals	39,859	9,018	10,981	53,362	1,948,353	274,582	221,646	631,178	1,639,476	605,104	2,116,713	1,518,795
Troll	48,377	5,524	1,999	7,108	132,751	32,702	8,154	5,704	9,297	1,267	1,859	598
Monthly Totals	88,236	14,542	12,980	60,470	2,081,104	307,284	229,800	636,882	1,648,773	606,371	2,118,572	1,519,393
June, Oct. and Nov. Totals									8,927	17,600	9,799	8,179
Season Totals									3,827,040	945,797	2,371,151	2,224,924

TABLE XI

DAILY CATCH OF PINK SALMON, 1967-1969-1971-1973 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1967	1969	1971	1973	1967	1969	1971	1973	1967	1969	1971	1973
1		24	Strike		528		6,406	3,396		40,906	6,913	167,083
2		15	June 26-		474		5,243	3,452		35,463	15,269	157,615
3			July 10				5,988		117,540		27,028	157,578
4				1		5,777			134,138		13,692	
5			1			4,773			128,994		13,768	
6				Strike	10,829	5,684		24,136	65,626		33,997	
7				July 6-	14,045			14,643	93,898	91,986		
8			1	July 15	17,863			13,373	100,559	29,915	141,120	
9					20,326		20,059	2,572		25,639	81,037	39,434
10							17,280	1,481		17,039	86,916	50,859
11			3			6,345	15,145		218,008	108,797	58,168	36,599
12			5			3,674			136,118		46,851	27,396
13						4,641		23,520	73,745		31,098	
14		34			146,394			24,987	31,250		34,631	
15			20	40	108,014			38,368			26,718	
16				90	105,629		16,750					
17	8			84			9,010			11,653		58,070
18	7			59		25,980			29,284	10,891		12,299
19	4		31			12,711			16,313			7,441
20			51			414		79,374	10,361		14,866	
21		74			67,700			71,878			7,649	
22		85			150,862		23,135	125,369	54,442		172,256	
23				7,155	168,186		25,979	10,591		2,206	27,182	
24	328			5,601			17,141			2,196		31,267
25	266			4,415					10,133			1,191
26	308		192			1,074	73,040		6,294		47,551	34,996
27	454	273	57				90,929	178,434	4,998		8,392	
28		1,848	217		210,531			131,738			1,299	
29		2,315			293,634			28,293			29,454	
30		2,044		2,963	239,917	36,049	224,988			477	17,488	
31	1,037	1,324		3,472	221,137	49,946	145,573					
Totals	2,412	8,036	578	23,880	1,776,069	157,068	696,666	775,605	1,231,701	377,168	943,343	781,828
Troll	99,288	35,622	41,634	93,200	663,415	150,136	245,984	248,042	197,605	26,298	121,281	52,393
Spring Salmon Gill Nets										55,538	16,822	7,305
Monthly Totals	101,700	43,658	42,212	117,080	2,439,484	307,204	942,650	1,023,647	1,429,306	459,004	1,081,446	841,526
June and Oct. Totals									186,432	51,639	71,029	78,426
Season Totals									4,156,922	861,505	2,137,337	2,060,679

Table XII

SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS

District and Streams	1973 *Period of Peak Spawning*	*Estimated Number of Pink Salmon*			
		1967	1969	1971	1973
EARLY RUNS					
LOWER FRASER					
Main Fraser	Oct. 2-8	785,797	848,532	928,046	766,053
HARRISON					
Chehalis River	Oct. 10-16	5,625	7,147	32,178	14,300
FRASER CANYON					
Coquihalla River	Oct. 2-6	3,045	2,415	16,778	11,994
Jones Creek	Oct. 3-8	3,162	1,779	1,304	2,544
Misc. Tributaries	Oct. 2-15	2,395	450	3,298	3,549
SETON-ANDERSON					
Seton Creek	Oct. 11-16	225,351	198,854	297,968	211,337
Portage Creek	Oct. 12-17	7,822	1,092	1,456	13,983
Bridge River	Oct. 11-16	6,547	13,034	8,817	23,738
THOMPSON					
Thompson River and Tributaries	Oct. 4-10	450,487	247,896	258,203	283,385
TOTAL*		1,490,231	1,321,199	1,553,363	1,330,883
LATE RUNS					
HARRISON					
Harrison River	Oct. 14-20	64,576	96,390	73,881	196,150
Weaver Creek	Oct. 12-15	786	725	1,435	895
CHILLIWACK-VEDDER					
Chilliwack-Vedder River	Oct. 11-15	252,585	92,222	160,511	210,799
Sweltzer Creek	Oct. 16-20	19,586	18,923	13,122	15,265
TOTAL*		341,141	208,260	250,389	423,109
GRAND TOTAL*		1,831,372	1,529,459	1,803,752	1,754,111

* Totals may include small numbers of fish in small tributaries not listed in the table.

COMMISSION PUBLICATIONS, 1974

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1973.

2. Progress Report Number 29. Acute Toxicity of Municipal Sewage to Fingerling Sockeye Salmon by D. W. Martens and J. A. Servizi.

3. Progress Report Number 30. Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon by J. A. Servizi and D. W. Martens.

4. Progress Report Number 31. Acute Toxicity and Detoxification of Kraft Pulp Mill Effluent by R. W. Gordon and J. A. Servizi.

5. Booklet and Pamphlets, 1974 Editions
   Salute to the Sockeye
   Hell's Gate Fishways
   Weaver Creek Spawning Channel
   Gates Creek Spawning Channel

STAFF PUBLICATIONS IN OTHER JOURNALS

Factors Affecting Sockeye Salmon *(Oncorhynchus nerka)* Growth in Four Lakes of the Fraser River System by J. C. Goodlad, T. W. Gjernes, International Pacific Salmon Fisheries Commission, and E. L. Brannon, College of Fisheries, University of Washington. J. Fish. Res. Board Can. 31: 871-892.

STAFF

A. C. Cooper, Director

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Mrs. G. Coupar (from February)
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H. K. Hiltz
L. W. Johnston
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Operations Division
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HELL'S GATE FISHWAYS — F. R. Johnston
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